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Stuart G. Hibben

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13. ABSTRACT

This report includes abstracts and bibliographic lists on contractual subjects that were completed in July, 1973. The major topics are: laser technology, effects of strong explosions, geosciences, particle beams, material sciences, and miscellaneous interest items. A section on atmospheric physics is being published separately.

Laser coverage is generally limited to high power effects; all current laser material is routinely entered in the quarterly laser bibliographies.

An index identifying source abbreviations and a first-author index to the abstracts are appended.

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92

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TABLE OF CONTENTS

1. Laser Technology

A. Abstracts

Batanov, V. A., and V. B. Fedorov. Liquid phase flushing - a newly observed mechanism of crater formation during vaporization rise in a laser irradiated metal target. ZhETF P, v. 17, no. 7, 1973, 348-351.

Beam-target conditions are considered under which the main ejection mechanism from the melt zone is by flushing out of the liquid material by vapor pressure, as distinguished from direct vaporization ejection. The conditions for the flushing phase require a relatively shallow crater with a moderate incident beam intensity; quantitatively the conditions are given by

$$t\,(4\pi^2 v_z^2 \lambda - d^4)^{1/3} > 1. \qquad (1)$$

where t = laser pulse duration, d = crater diameter and v_z = vapor velocity component normal to the target surface.

Experiments with an aluminum target exposed to millisecond laser pulses generally confirm the theory; Fig. 1 shows the results. Here the flushing mechanism occurred up to about 9 Mw/cm^2 density, after which direct vaporization ejection begins and crater depth increases more rapidly. Photos of crater formation confirmed that the two discrete phases did occur.

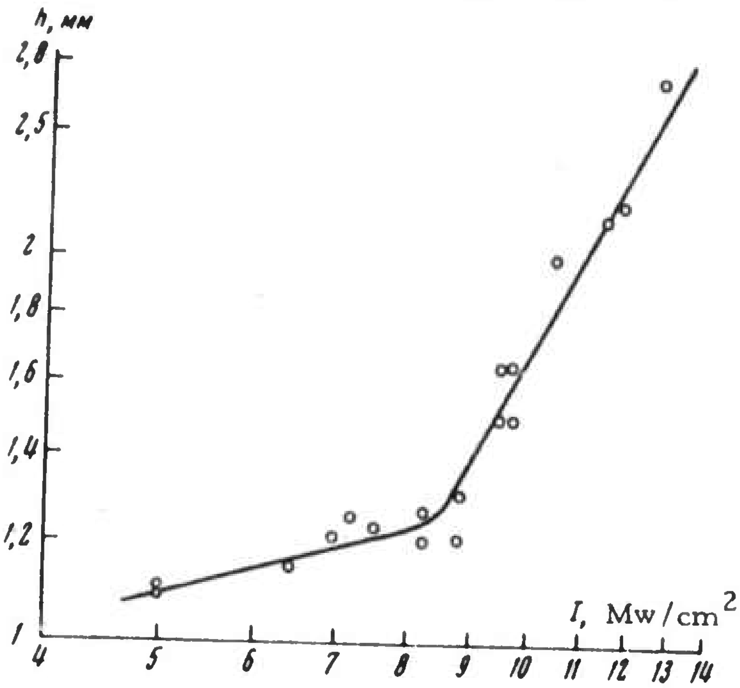

Fig. 1. Mean crater depth in Al vs. laser power density.

Bonch-Bruyevich, A. M., Ye. I. Balashov, A. I. Gagarin, A. S. Zakharov, V. N. Kotylev, and O. I. Kalabushkin. Experimental study of shielding by aluminum vapor. ZhETF P, v. 17, no. 7, 1973, 341-344.

Tests are described in observing the extent and nature of the vapor cloud generated by laser impact with an aluminum target. The laser used was free-running at 1.06μ and 1 millisecond pulses of up to 25×10^6 w/cm^2, focused to 0.8 cm^2 or less on the target surface. To record transmissibility of the vapor cloud, a 1 mm aperture was left in the target to allow comparison of incident and transmitted pulses; a second laser probed the cloud laterally at

varying distances from the surface. Finally, a third laser was used, also parallel to the target face but with a beam diameter > 2 cm, to furnish shadow photos of the entire cloud region.

Results show a rapid drop in transmission within 50-80 μsec after pulse incidence. Fig. 1 is a shadow photo of a 4 mm wide target after pulse start, showing the approximately 1 mm deep vapor cloud region. Graphical data show an apparently linear drop in transmissibility with increased pulse power, for both the axial and transverse directions.

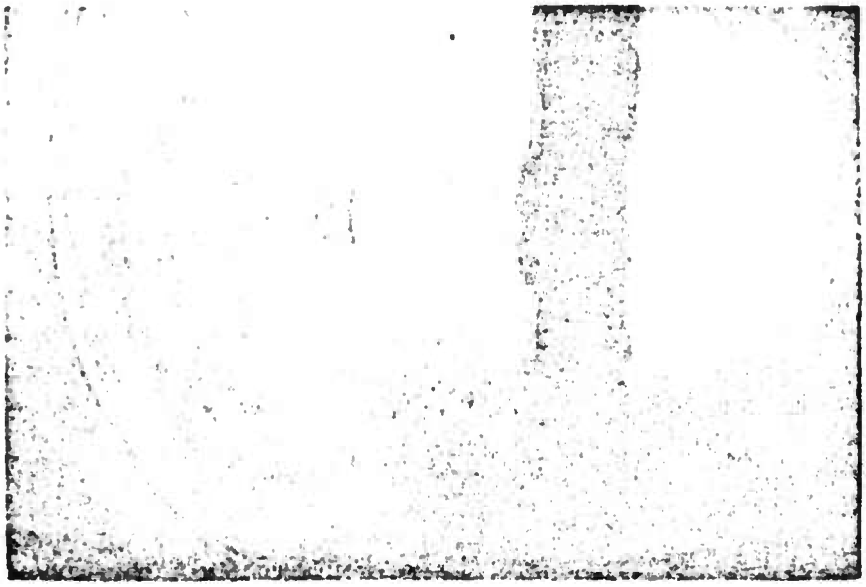

Fig. 1. Vapor cloud, Al target.

25 μs after pulse start; target width is 4 mm, laser beam from left. Shock wave velocity = 700 m/sec.

Belyayev, L. M., V. V. Nabatov, V. N. Rozhanskiy, N. L. Sizova, and A. A. Urusovskaya. Damage mechanism to the surface of a CsI crystal by a focused laser beam. Kristal, no. 2, 1973, 334-338.

Qualitative effects of a laser beam focused on CsI crystals are discussed for intensities both above and below damage threshold. The crystals were cut to 2 mm thick platelets and chemically polished, then exposed to a free-running ruby laser with a focused spot diameter of 330 microns, applied through variable-density filters. Threshold was about 130 j/cm^2; levels up to 250 j/cm^2 were used, which was in some cases sufficient to pierce the specimen.

The article mainly discusses the observed effects on crystal structure as a function of orientation and of laser parameters. Fig. 1 shows extrusion effects in two planes for intensity just over threshold. Studies were also done on sub-threshold effects by etching the surface layer away; these showed dislocation effects around inclusions caused by laser exposure.

Fig. 1. Extrusion configurations in laser-irradiated CsI, x 200.

a - [100] plane; b - [110] plane.

Hasse, R., A. Knecht, and N. Neuroth. Damage to optical glass by giant laser pulses. Part II. Internal glass damage by a converging beam. Schott.-Inform, no. 2, 1972, 8-14 (RZhF, 1/73, no. 1Ye292) (Translation)

Damage thresholds for 103 types of optical, quartz and IR glass were determined, using 40 μsec laser pulses at 1.06 μ. The laser beam was focused on the test specimen by a lens with f = 100 mm. Correlations were obtained between damage threshold and the following glass parameters; thermal conductivity index, density, refractive index, scratch resistance, and conductivity behavior in the neighborhood of the softening point.

Marin, O. Ye., N. F. Pilipetskiy, and V. A. Upadyshev. Formation of laser-initiated cracks. MP, no. 1, 1973, 82-89.

Initiation of cracks in PMMA from laser irradiation was studied experimentally, to clarify inconsistencies in the mechanism of crack formation, postulated on the basis of earlier studies. Irradiation was done with 10^{-3} sec. pulses from a free-running CO_2 laser. Crack edges were exposed to the incident beam to exclude the possibility of crack propagation from direct absorption by the entire crack area. In this way, gas-filled cavities with nucleating microcracks were detected as the single energy sources for fracture. The cavities are generated by decomposed material in random points of the continuum, owing to laser radiation absorption in discrete microheterogeneities.

Diameters of 36 cavities and cracks were measured and gas pressures in the cavity-crack system were calculated for a gas with $\gamma = Cp/Cv = 1.1$. The tabulated data (Table 1) and photographs of the cavities and cracks in

Table 1. Experimental parameters of laser-initiated cavities and cracks in PMMA

Cavity diam., $D_0 \cdot 10^{[illegible]}$ cm	Cavity volume $V_0 \cdot 10^{[illegible]}$ cm³	Crack diam., $D_T \cdot 10^{[illegible]}$ cm	Crack area, $S_T \cdot 10^{[illegible]}$ cm²	Crack volume, $V_T \cdot 10^{[illegible]}$ cm³	$d = \frac{D_T}{D_0}$	$B = \frac{V_T}{V_0}$	Gas pressure in: crack, P_T bar	cavity P_o bar
4,2	380	22,6	40,0	1780	5,4	4,7	630	3 800
3,3	180	19,8	30,8	1290	6,1	7,1	680	5 900
2,7	99	16,5	21,4	810	6,2	8,2	740	7 400
2,5	82	14,8	17,2	620	5,9	7,6	790	7 400
2,2	56	13,2	13,7	460	6,0	8,2	830	7 400
2,1	47	11,7	10,7	340	5,6	7,3	880	8 300
1,8	29	11,9	11,1	360	6,7	12,2	880	7 900
1,6	20	9,8	7,5	220	6,3	11,2	880	12 700
1,2	9,2	9,3	6,8	190	7,7	20,7	970	12 900
1,1	6,2	9,0	6,3	180	8,5	29,0	990	23 600
							1000	32 800

the process of formation are shown (Fig. 2); the tabulated data are the

Fig. 2. Crack propagation from cavities

a- typical planar formation; b- rarer case of two necks propagating from one spherical center.

averages of 2-5 measurements. Diameter distribution of cavities shows that most have D_o = 10-30 μ.

The cited data suggest the following fracture initiation mechanism for plexiglass: nucleation centers (cavities), at $(2\text{-}3)\times10^3$ °K and 10^3-10^4 atm are surrounded by a liquefied layer of compressed, hot material in which quasibrittle fracture becomes impossible. After attaining a critical dimension (~20-30 μ), a cavity develops necks in the direction of colder material. Subsequently, a neck develops a plane nucleating crack on account of pressure relief; the crack propagates further by direct absorption of radiation. Formation of one large crack from several nucleation centers was in fact observed in subsurface PMMA layers irradiated with CO_2 laser at a moderate power density.

Rubinshteyn, A. I., and V. M. Fayn. Theory of avalanche ionization in transparent dielectrics from the effects of a powerful electromagnetic field. FTT, no. 2, 1973, 470-478.

Probability of avalanche ionization by cumulation of optical pulse energy in a conduction-band electron to a level above the ionization energy I was analyzed theoretically, without imposing the limitation of a weak alternating field. Avalanche ionization from the effect of a moderate or high-intensity alternating field was also covered by the study, because of its practical importance. The cited problem is treated in the framework of the elemental and kinetic theories, with allowance for single-photon or multiphoton mechanisms of energy transfer. In the case of single-photon transition, analysis of the energy balance of a "seed" electron in the conduction band (elemental theory) led to the conclusion that in a strong field the electron acquires a maximum but limited energy ϵ_{max}. There is a field energy value at which avalanche ionization begins, if $\epsilon_{max} > I$. At $\epsilon_{max} < I$, avalanche ionization cannot occur, regardless of the field magnitude. A similar conclusion

was drawn from application of kinetic theory to single photon transition. However, at $\epsilon_{max} < I$, the probability of avalanche ionization is found to be exponentially small. In that case, an n-photon transition mechanism may effectively determine avalanche ionization.

Lariokhin, B. Lasers in 1973 [Survey of foreign technology]. Krasnaya zvezda, 15 February 1973, p. 3.

In a second article on lasers, the author reviews American, British, and West German periodical literature on recent advances in laser military applications. Developments are reported of laser use in weapon control systems, aerial reconnaissance, and target observation. The cited laser applications in weapon control systems include laser guidance of artillery shells, bombs, ground-to-ground tactical ballistic missiles. Discussions are also cited on laser use for target selection from tactical aircraft, simultaneously with or separately from their use in weapon guidance systems. Foreign (mainly American) aerial laser reconnaissance systems are described, particularly the three-dimensional systems. R&D is reviewed of complex target observation systems using several lasers emitting at different wavelengths.

Raychenko, A. I. Heat propagation in a solid from the action of a short thermal pulse. FiKhOM, no. 2, 1973, 137-141.

The one-dimensional boundary value problem of heat propagation in a semi-finite solid from interaction with a pulsed laser beam is solved, with allowance for a finite speed c of heat propagation. The problem is formulated by a so-called telegraph equation of hyperbolic type. A solution to the problem is obtained in the form of a temperature function $T_t(x, t)$, where x and t are the space and time coordinates. The solution for $T_t(x, t)$ in dimensionless variables $\vartheta = kt/x^2$ and $\xi = cx/k$, where k is thermal diffusivity, reduces to that of a classic parabolic-type equation for the case of high ϑ values and $c \to \infty$. In the opposite case of temperature field behind the thermal excitation front, i.e. $T_t'(\xi, \vartheta) = 0$ and $1/\xi > \vartheta$, there is a zero value region of T_t' in the $\xi^{-1}\vartheta$ plane, i.e. $T_t'(\xi, \vartheta) = 0$ when ξ^{-1} and ϑ vary from $10(1-8\times10^{-4})$ to $10(1+8\times10^{-4})$ and from $10^{-1}(1-8\times10^{-4})$ to $10^{-1}(1+8\times10^{-4})$, respectively. In contrast, the solution of a parabolic equation for T_p' without allowance for c is different from zero for all ξ^{-1} and ϑ values. Examples of evaluating the heating effect by both formulas are given.

Vinogradov, A. V., B. Ya. Zel'dovich, and I. I. Sobel'man. Effect of saturation on stimulated scattering from laser heating of plasma. ZhETF P, v. 17, no. 5, 1973, 271-274.

Several important factors, unaccounted for in earlier studies, e.g., by Galeyev et al (cf May 1973 Report, p. 11), on stimulated scattering of powerful laser radiation in a dense plasma. are discussed. Calculation of the pumping energy reflection R from the plasma shows that nonlinear effects

must be accounted for in correct evaluation of gain (g). The most important is the saturation effect, i.e., deformation due to scattering, of the electron velocity distribution function. Calculation of g for a plasma with density $N < 10^{19}$ without allowance for saturation indicated that a significant laser radiation conversion into scattered waves (Thomson scattering) requires laser power densities $P_L > 10^{16}$ w/cm^2. Saturation at this P_L is shown to limit R by a plasma layer $L < 10^{-2}$ cm with $N_e < 10^{19}$ of stimulated Thomson scattering at the 2×10^{11} w/cm^2 level. In a $\sim 10^{-2}$ cm plasma layer with $N_e > 10^{19}$ and $T_e = T_i$ saturation similarly limits stimulated scattering by ions to the 10^{13} w/cm^2 level, thus minimizing R. The authors note that the modulation index required for a significant R is inversely proportional to L, and hence is very sensitive to the laser pulse shape.

Volyak, T. B., S. D. Kaytmazov, A. M. Prokhorov, and Ye. I. Shklovskiy. Effect of magnetic field on soft x-radiation in a laser plasma. ZhETF, v. 64, no. 2, 1973, 481-484.

The effect of a strong magnetic field on intensity of soft x-rays in the 3-10 Å and 3-7 Å ranges was studied experimentally. The x-rays were generated by radiation of a plasma created by interaction of a Q-switched laser beam at $\lambda = 1.06\ \mu$ with a copper target, positioned in a vacuum chamber within the cavity of a solenoid coil. Laser pulses of 3-6 j and ~40 nsec half-width were applied. The plasma electron temperature $T_e \approx$ 200-250 ev was determined from the recorded intensity ratio of x-rays transmitted through two different Be filters. It was observed that in the presence of a 200 kOe field, the total energy of x-rays transmitted through each filter decreased on the average by a 2.5 factor. Evaluation of the plasma parameters revealed

that the magnetic field-induced additional absorption of laser radiation by the plasma can be the cause of the observed phenomenon. Hence, the focused radiation power density must decrease, since the optically dense plasma shields the target from the laser beam.

The experiment shows that using a field geometry which prevents plasma dispersion toward the laser beam, and positioning the target plane at an angle to the optical axis, are necessary conditions for efficient plasma heating in a magnetic field.

Kurbatov, Yu. A., and V. F. Tarasenko. <u>Time characteristics of spark discharges initiated by laser bursts</u>. PTE, no. 1, 1973, 142-144.

Experiments are described on triggering a spark discharge by a pulsed nitrogen gas laser beam at 3371 Å with 10 kw peak pulse power and 4 nsec pulse half-width. The laser was intended to decrease the power requirement for a spark discharge. Two experimental spark gap circuits are described: the first for 1 and 3 mm gaps with 10-40 kv applied voltage pulses at 1-3 atm. pressure in the test chamber, the second for 5 and 10 mm gaps with 50-200 kv applied bell-shaped pulses at a pressure $p = 1\text{-}8$ atm. In both arrangements, a copper cathode was irradiated by a nonfocused laser beam through a wire mesh anode. In all experiments without laser irradiation, either discharge time lag t_3 was much greater than with the intensifier pulse, or breakdown did not occur. The experimental data illustrated by the plots of commutation time t_k versus field intensity E, or p and $t_3 p$ versus E/p, show that t_3 relative to the time of cathode irradiation was 1-100 nsec, depending on experimental conditions. Measured fluctuations Δt_3 were not over 3 nsec even at a nearly static breakdown voltage.

Rodichkin, V. A., and G. Ya. Rusakova. Effect of electrode-target polarity and lens focal plane position on laser-ignited discharge characteristics. ZhTF, no. 2, 1973, 345-348.

Divergence of opinion on selection of the electrode-target polarity which would minimize response delay of a laser-ignited air discharge gap prompted the present experimental study of the breakdown time lag, at power densities near the optical breakdown threshold. A 20 Mw Q-switched ruby laser beam was focused in an 11.7 mm discharge gap, and breakdown time lag was measured by a method analogous to that described earlier by Babalin et al (ZhTF, 1970, 1718). The average power density in the focal plane of the focusing lens was $\sim 2\times10^{10}$ w/cm^2.

The experimental plots of breakdown time lag (Fig. 1) show that at Eo/p >> 23 v/cm x torr, t_3 is shorter, when the target electrode is the anode rather than the cathode of the discharge gap. The opposite is true for

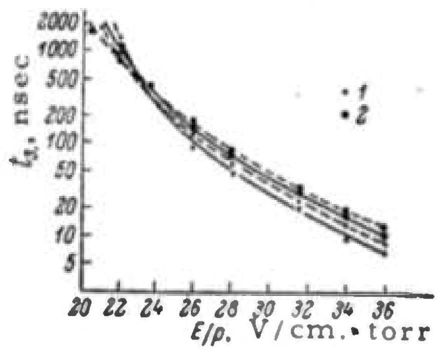

Fig. 1. Breakdown time lag t_3 versus Eo/p, where Eo is the electrostatic field potential across the gap, and p is gas pressure. Lens focal plane - target electrode distance x = 5 mm (solid curves) and 0 (dashed curves); points 1 and 2 correspond to the data with positive (anode) and negative (cathode) electrode target, respectively.

the $Eo/p \leq 23$ v/cm x torr region. At $Eo/p \geq 24$ V/cm x torr, t_3 decreases with increasing x. In contrast, at $Eo/p \leq 24$ V/cm x torr, t_3 increases with lengthening of x. At $Eo/p \approx 24$ V/cm x torr, t_3 is nearly independent of x < 6 mm.

The cited data are interpreted by means of shadow photographs of the discharge channel, which were taken at x = 4 mm, Eo/p = 31 V/cm x torr, and a 20 nsec delay of intensifier pulse. Once the channel is formed the discharge gap can be treated as the "point-plane" gap. This assumption was confirmed in the experiment with a metallic point substituted for the plasma point. The main conclusion was drawn that at a beam intensity above the laser flare formation threshold, but lower than gas breakdown threshold, radiation must be focused on the positive electrode to minimize breakdown time lag, and on the negative electrode to maximize the working range of potentials across the electrodes of the laser-ignited discharge gap.

Karlov, N. V., N. A. Karpov, Yu. N. Petrov, and O. M. Stel'makh. Self-focusing of CO_2 laser emission in resonance absorptive gases. ZhETF P, v. 17, no. 7, 1973, 337-340.

Self-focusing was observed of pulsed CO_2 laser radiation during its propagation in resonance absorptive gases BCl_3 and SF_6 at 10.6 μ. Experiment was conducted with a 5-10 kw CO_2 laser and 20 μsec pulse duration. The radiation was focused in front of the window of the test vessel, such that diverging rays passed through the specimen gas. When BCl_3 was irradiated at 1 atm, self-focusing occurred at a point a certain distance from the window; an increase of laser power gave rise to a number of self-focus

points. The distance of the focusing points increased with pressure drop and at pressures less than 0.1 atm. beam constriction was insignificant.

In the case of SF_6. the focusing distance was very small. At 0.25 atm self-focusing in SF_6 was a thin beam of diameter 0.2 mm and at a distance of 3-4 cm. A relationship is plotted of the nonlinear refractive index n_2 as a function of gas pressure (Fig. 1). The maximum value of n_2 for BCl_3

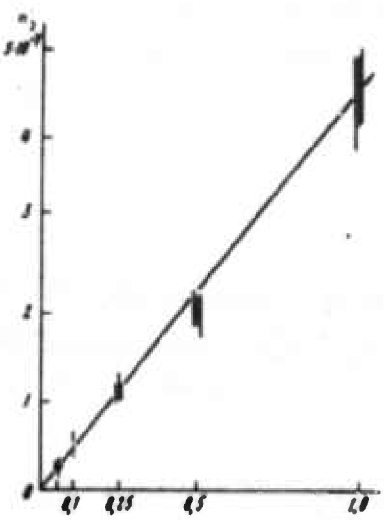

Fig. 1. Relationship of refractive index n_2 in BCl_3 to gas pressure.

is $(4.6 \pm 0.7)\mathrm{x}10^{-7}$ P CGSE and for SF_6 - $5\mathrm{x}10^{-5}$ P CGSE, where P=gas pressure

Anisimov, S. I., and A. Kh. Rakhmatulina. <u>Dynamics of vapor expansion from evaporation in vacuo.</u> ZhETF, v. 64, no. 4, 1973, 869-876.

The dynamics of vapor expansion from laser evaporation is theoretically examined using the Boltzmann equations for gas motion. The

authors consider the evaporation of a semi-infinite solid body with a constant temperature T_0 in an initially empty space. Equations are obtained for the motion of the evolved gas; solutions are limited to one-dimensional unstable problems, and the surface temperature and particle distribution function of surface ejecta are assumed to be independent of time. A transition is observed from a free-molecular regime of vapor expansion, occurring at the initial evaporation stage, to motion of a continuous medium. Conditions are discussed under which the motion of the vapor bulk can be expressed by gas dynamics equations. Boundary conditions are obtained for gas dynamics equations at the evaporation surface.

Burakov, V. S. Inertness criteria of a plasma to powerful laser radiation. ZhPS, v. 18, no. 4, 1973, 604-609.

The author attempts to define the level in laser diagnostics of a plasma at which the laser intensity exceeds some threshold, beyond which its effect on the plasma unduly distorts the original state under observation. This is broadly defined as the plasma excitation limit; for purposes of argument it is here given as a degree of change in optical density $\delta = 2\sigma$ of a specified plasma layer, where σ is unit measurement error. In practical cases, δ is in the vicinity of 0.1. With this criterion the author derives approximate expressions for tolerable laser probe density, differentiating between the excitation effects of short and long pulses relative to τ^*, the time to establish a Boltzmann distribution of population.

The theoretical results were tested against data of Burakov et al (ZhPS, v. 16, 1972, 240) for pulsed ruby passage through a hydrogen and carbon plasma, and gave a theoretical threshold of 2.5 Mw/cm^2; against the actual value of 3--5 Mw/cm^2; an analogous result was obtained for a xenon plasma (Generalov et al, ZhETF, v. 56, 1969, 789). The discrepancies are considered tolerable in view of the approximate nature of the theoretical formulas used.

B. Recent Selections

i. Beam-Target Effects

Buravl'ov, Yu. M., B. P. Nadezhda, and I. O. Novokhats'kiy. Certain characteristics of the effect of focused laser radiation [on materials]. IN: Fiz. tverdogo tela. Res. mezhved. temat. nauch-tekhn. sb., no. 2, 1972, 87-90. (RZhMetallurgiya, 6/73, no. 6I863).

Gulyayeva, A. S., M. A. Gurevich, L. A. Zhukova, N. M. Klimova, B. A. Krasyuk, and V. N. Maslov. Structural changes in gallium arsenide caused by laser radiation. FiKhOM, no. 3, 1973, 17-21.

Gurevich, G. L. Theory of thin film destruction by laser radiation. FiKhOM, no. 3, 1973, 5-11.

Korolev, N. V., V. V. Ryukhin, and G. B. Lodin. Laser microanalysis with controlled electrical synchronization of probe excitation. ZhPS, v. 19, no. 1, 1973, 21-26.

Kovarskiy, V. A., N. F. Perel'man, and E. P. Sinyavskiy. Nonradiating recombination in semiconductors at a deep level in a strong electromagnetic wave field. FTT, no. 6, 1973, 1809-1813.

Nemchinov, I. V. Gas dispersion behind deflagration waves, actuated by powerful radiation flux. ZhPMTF, no. 3, 1973, 41-48.

Sapozhnikov, A. T. Self-similar dispersion of vaporization products of a solid wall caused by variable energy release. ZhPMTF, no. 3, 1973, 49-54.

Uglov, A. A., and A. N. Kokora. Various effects during metal hardening in laser radiation interaction zones. FiKhOM, no. 3, 1973, 12-16.

Zakharov, V. P., and I. M. Protas. Modifying a spark mass spectrometer with double focusing for studying the interaction of laser radiation with solids. PTE, no. 3, 1973, 162-165.

ii. Beam-Plasma Interaction

Aliyev, Yu. M., O. M. Gradov, and A. Yu. Kiriy. Parametric instability theory of a confined uniform plasma. ZhTF, no. 6, 1973, 1163-1169.

Anisimov, A. I., N. I. Vinogradov, V. V. D'yachenko, and O. N. Shcherbinin. Experimental observation of high-frequency wave decay in plasma. ZhTF, no. 6, 1973, 1321-1323.

Chernenko, V. M. Electron scatter near a laser focus. ZhETF, v. 64, no. 6, 1973, 1975-1985.

Karlov, N. V., N. A. Karpov, Yu. N. Petrov, and O. M. Stel'makh. Dissociation and illumination of a multilevel molecular gas caused by powerful CO_2 laser radiation. ZhETF, v. 64, no. 6, 1973, 2008-2016

Pforr, G., and H. Lauterbach. Thermodynamic calculation of plasma-chemical reactions. Wiss Z. F. Schiller-Univ. Jena. Math. naturwiss. R., v. 21, no. 3, 1972, 565-579. (RZhKh, 13/73, no. 13B728)

Savranskiy, V. V., and A. A. Samokhin. Laser heating of a tubular target. DAN SSSR, v. 210, no. 5, 1973, 1053-1055.

2. Effects of Strong Explosions

A. Recent Selections

i. Shock Wave Effects

Anan'in, A. V., A. N. Dremin, and G. I. Kanel'. The structure of shock and rarefaction waves in iron. FGiV, no. 3, 1973, 437-443.

Breusov, O. N., A. N. Dremin, V. N. Drobyshev, and S. V. Pershin. Action of shock waves on tantalum pentoxide. ZhNKh, v. 18, no. 2, 1973, 295-299. (RZhKh, 12/73, no. 12B866)

Burdukov, A. P., V. V. Kuznetsov S. S. Kutateladze, V. Ye. Nakoryakov, B. G. Pokusayev, and I. R. Shreyber. Shock wave in a gaseous-liquid medium. ZhPMTF, no. 3, 1973, 65-69.

Chachin, V. N., L. I. Sankovich, and M. T. Seryy. Effectiveness of using shock waves at outlet cross-section of the working chambers of electro-hydraulic equipments. IAN B, no. 2, 1973, 72-78.

Dremin, A. N., and A. N. Mikhaylov. On studying the detonation initiation of explosives by shock waves, using an electrical conductivity method. FGiV, no. 3, 1973, 420-424.

Dudnikova, G. I. Unstable shock waves in a rarefied plasma. ZhPMTF, no. 3, 1973, 10-15.

Gilinskiy, S. M., V. P. Shkadova, and T. S. Novikova. Flow of a H_2-Cl_2-Ar mixture behind a detached shock wave. FGiV, no. 3, 1973, 345-351.

Gryaznov, V. K., I. L. Iosilevskiy, and V. Ye. Fortov. Calculating shock adiabats of argon and xenon. ZhPMTF, no. 3, 1973, 70-76.

Ibragimova, L. B. Investigating the excitation mechanism of the electron state of cyanogen molecules in shock waves. IN: Nauch. tr. in-t. mekh. Mosk. un-ta., no. 18, 1972, 70-87. (RZhMekh, 5/73, no. 5B175)

Kozorezov, K. I., L. I. Mirkin, and N. F. Skugorova. Saturation of metal surfaces by compounds and solid solutions, synthesized in a shock wave. DAN SSSR, v. 210, no. 5, 1973, 1067-1070.

Losev, S. A. Investigating the kinetics of physicochemical processes in shock tubes. IN: Sbornik. Goreniye i vzryv. Moskva, Nauka, 1972, 672-678. (RZhMekh, 5/73, no. 5B173)

Makovskiy, Yu. F., and F. V. Shugayev. Interaction of a shock wave with blunt bodies in supersonic flow. I-FZh, v. 25, no. 1, 1973, 107-110.

Mirskiy, V. N. Conditions on incident and reflecting shock waves in anequilibrium gas. IN: Nauch. tr. in-t. mekh. Mosk. un-ta., no. 19, 1972, 58-65. (RZhMekh, 5/73, no. 5B170)

Mogilevich, L. I. Some problems of irregular disturbances during weak shock wave motion. IN: Aerodinamika. Mezhvuz. sb., no. 1(4), 1972, 51-60. (RZhMekh, 5/73, no. 5B146)

Nelasov, Yu. P. Shock adiabats and neighboring explosive zone in drilling fluids of different density. ZhPMTF, no. 3, 1973, 77-82.

Nesterenko, V. F., A. M. Staver, and B. K. Styron. Heat wave preceding the shock wave front in metals. FGiV, no. 3, 1973, 433-436.

Novgorodov, M. A., Yu. A. Polyakov, V. A. Tishchenko, and E. K. Chekalin. Investigating the electron concentration behind strong shock waves. ZhTF, no. 6, 1973, 1196-1202.

Roman, O. V., V. P. Kuznetsov, and I. M. Pikus. Detector of shock wave front velocity. Author's certificate, USSR, no. 382001, published July 6, 1971. (Otkr izobr, 22/72, p. 131)

Soloukhin, R. I. Shock waves in reacting gases. IN: Sbornik, Aerofiz. issledovaniya. Novosibirsk, 1972, 52-57. (RZhKh, 12/73, no. 12B997)

Tyunyayev, Yu. I., and V. N. Mineyev. Polarization mechanism of doped alkali-halide crystals in shock waves. FTT, no. 6, 1973, 1901-1904.

Vel'misov, P. A., and G. P. Shindyapin. Asymptotic study of nonlinear interactions of weak shock waves. IN: Aerodinamika, Mezhvuz. sb., no. 1(4), 1972, 78-93 (RZhMekh, 5/73, no. 5B147)

Zharov, A. I., M. S. Mikhalev, R. Z. Kats, and V. S. Dmitriyeva. Strain hardening of copper, nickel and G31 alloy by compression and explosion. FGiV, no. 3, 1973, 443-447.

ii. Hypersonic Flow

Antonov, A. S., B. V. Boshenyatov, B. N. Gilyazetdinov, and V. V Zatoloka. Experiments in the IT-301 hypersonic impulse tube at M_H = 11.5 with a flat hypersonic exit cone model. IN: Sbornik. Aerofiz. issledovaniya. Novosibirsk, 1972, 109-111. (RZhMekh, 5/73, no. 5B297).

Antonov, A. S., B. V. Boshenyatov, B. N Gilyazetdinov, B. I. Gutov, and V. V. Zatoloka. Testing of hypersonic axisymmetric diffuser of internal compression in the IT-301 hypersonic impulse tube at $M_H = 11.5$. IN: ibid, 108-109. (RZhMekh, 5/73, no. 5B300)

Dem'yanenko, V. S. Supersonic flow over the angle formed by intersecting plane surfaces. IN: Sbornik. Aerofiz. issledovaniya. Novosibirsk, 1972, p. 97. (RZhMekh, 5/73, no. 5B253)

Dem'yanenko, V. S., and Ye. K. Derunov. Supersonic flow over a right angle. IN: ibid., 97-100. (RZhMekh, 5/73, no. 5B254)

Dorot, V. L., and M. Kh. Strelets. Porous cooling in a supersonic turbulent boundary layer. TVT, no. 3, 1973, 551-560.

Gusev, V. N., and T. V. Klimova. Similarity of hypersonic jet flows. IN: Uch. zap. Tsentr. aerogidrodinam. in-ta, v. 3, no. 6, 1972, 1-9. (RZhMekh, 5/73, no. 5B338)

Karasev, A. B., and T. V. Kondranin. Certain laws of heat exchange in a hypersonic shock layer under conditions of mass removal. MZhiG, no. 3, 1973, 136-143.

Karpunov, Ye. G., L. M. Negrutsak, A. B. Ryzhik, S. I. Frayerman, and Yu. A. Yurmanov. Spectroscopic investigations of supersonic heterogeneous flows with a combustible condensed phase. FGiV, no. 3, 1973, 387-391.

Korobitsyn, G. P. Numerical calculation of supersonic flow over rotating bodies. IN: Sbornik. Materialy 3-y nauch. konf. Tomsk. un-ta po mat. i mekh., no. 2, Tomsk, Tomsk. un-t, 1973, 15-16. (RZhMekh, 5/73, no. 5B247)

Krylov, B. V., and B. M. Pavlov. Using an implicit difference scheme for calculating a supersonic viscous gas end flow. IN: Sb. rabot Vychisl. tsentra Mosk. un-ta , no. 19, 1972, 13-19. (RZhMekh, 5/73, no. 5B252)

Lapygin, V. I. Solving problem on flow over a V- wing with a strong shock wave at the leading edge. MZhiG, no. 3, 1973, 114-119.

Neyland, V. Ya. Gas injection in hypersonic flow. IN: Uch. zap. Tsentr. aerogidrodinam. in-ta., v. 3, no. 6, 1972, 29-40. (RZhMekh, 5/73, no. 5B341)

Nikolayev, A. V., A. I. Tolmanov, and V. V. Filatov. Critical pressure drop during interaction of a spatial shock wave with a turbulent boundary layer on a thin rod. IN: Gidroaeromekh. i teoriya uprugosti. Mezhvuz. nauch. sb., no. 15, 1972, 88-92. (RZhMekh, 5/73, no. 5B257)

Skorodinskiy, I. T. Effect of Mach number on the optimum form of the bow section of a rotating body at hypersonic velocities. IN: Sbornik. Meterialy 3-y nauch. Konf. Tomsk. un-ta. po mat i mekh., no. 2. Tomsk, Tomsk. un-t., 1973, p. 24. (RZhMekh, 5/73, no. 5B249)

Timoshenko, V. I. Calculating parameters of supersonic gas flow at the converging tail section of a rotating body. IN: Gidroaeromekh. i teoriya uprugosti. Mezhvuz. nauch. sb., no. 15, 1972, 93-97. (RZhMekh, 5/73, no. 5B248)

Vetlutskiy, V. N., V. L. Ganimedov, and N. V. Gomon. Supersonic flow over a skewed sharp elliptical cone. IN: Sbornik. Aerofiz. issledovaniya. Novosibirsk, 1972, 92-93. (RZhMekh, 5/73, no. 5B243).

Yemel'yanova, Z. M., and B. M. Pavlov. Calculating viscous supersonic flow over blunt conical bodies. IN: Sb. rabot vychisl. tsentra Mosk. un-ta., no. 19, 1972, 3-12. (RZhMekh, 5/73, no. 5B245

Yen'shin, A. V. Characteristics of trails behind bodies flying at hypersonic velocity. IN: Sbornik. Materialy 3-y nauch. Konf. Tomsk. un-ta po mat. i mekh., no. 2, Tomsk Tomsl. un-t., 1973, p. 9. (RZhMekh, 5/73, no. 5B360)

iii. Soil Mechanics

Drukovanyy, M. F., V. M. Komir, and V. M. Kuznetsov. Deystviye vzryva v gornykh porodakh. (Explosion effects in rock). Kiyev, Izd-vo Nauk. dumka, 1973, 184 p. (KL, 25/73, no. 19361)

Dyatlovitskiy, L. I., and D. M. Kalinichenko. Propagation of elastic waves in rock foundation of dams during core blasting. IN: Sbornik. Dinamika gidrotekh. sooruzh. Moskva, 1972, 81-86. (RZhMekh, 5/73, no. 5V801)

Klevtsov, I. V., P. D. Petrenko, I. P. Sadovoy, and A. V. Bass. Effect of orienting borehole charges relative to rock beds on the quality of ore pulverization. Gornyy zhurnal, no. 6, 1973, 42-43.

Lyakhov, G. M., and I. T. Tropin. Plane waves in soils and rocks considered as viscoelastic media. MTT, no. 3, 1973, 92-98.

Mekhanika i vzryvnoye razrusheniye gornykh porod. (Mechanics and explosive demolition of rocks). Kiyev, Izd-vo Nauk. dumka, 1972, 256 p. (KL, 25/73, no. 19367)

Nazin, V. V. Construction methods which reduce seismic effects on buildings. IN: Sbornik. Seysmichnost', seysmich. opasnost' Kryma i seysmostoykost' str-va. Kiyev, izd-vo Nauk. dumka, 1972, 147-159. (RZhMekh, 5/73, no. 5V819)

Plakhotnyy, P. I., K. N. Tkachuk, and V. A. Dorovskiy. Investigating stress and demolition fields during contour blasting. Fiziko-tekhnicheskiye problemy razrabotki poleznykh iskopayemykh, no. 6, 1972, 52-55.

Rasner, M. I., B. S. Davydov, V. Ya. Shvartser, V. S. Malyuchenko, and V. M. Timofeyev. Water saturated rock in quarries and an engineering assessment of the areas of application of granular Granulit (explosive). Gornyy zhurnal, no. 6, 1973, 39-42.

Sadovskiy, M. A., N. V. Mel'nikov, and G. P. Demidyuk. Basic trends in improving blasting operations in the mining industry. Fiziko-tekhnicheskiye problemy razrabotki poleznykh iskopayemykh, no. 3, 1973, 35-44.

Seinov, N. P. Povysheniye effektivnosti vzryvnykh rabot na ugol'nykh razrezakh (Obzor). (Improving effectiveness of blasting operations in coal cuts. (Review)). Moskva, 1972, 45 p. (KL Dop vyp, 5/73, no. 10733)

Vovk, A. A., G. I. Chernyy, and A. V. Mikhalyuk. Control of crack formation process in compressible rock during a confined explosion. Fiziko-tekhnicheskiye problemy razrabotki poleznykh iskopayemykh, no. 6, 1972, 70-74.

Vovk, A. A., G. I. Chernyy, and V. G. Kravets. Deystviye vzryva v gruntakh (Explosion effects in soil). Izd-vo Naukova dumka. (NK, 24/73, to be published late 1974)

Vovk, A. A., V. I. Pluzhnik, V. G. Kravets, V. V. Gnutov, and P. A. Parshukov. Problem of explosion damping of long Igdanite charges. Fiziko-tekhnicheskiye problemy razrabotki poleznykh iskopayemykh, no. 3, 1973, 54-59.

iv. Exploding Wire.

Alenichev, V. S., M. A. Mel'nikov, and L. F. Panichkina. Optical investigations of hydrodynamic characteristcs of electric wire explosions. EOM, no. 3, 1973, 60-63.

Chachin, V. N., V. K. Rakhuba, and N. N. Stolovich. Investigating the deformation rate of tubular parts during their expansion by electric explosion. IAN B, ser. fiz-tekhn., no. 2, 1973, 79-81.

Kaliski, S. Spherically symmetrical uniform compression wave, generated by thermal explosion of shells. Biul. WAT J. Dabrowskiego v. 21, no. 11, 1972, 11-16. (RZhMekh, 5/73, no. 5B184).

Krivitskiy, Ye. V. Investigating effects of conductor explosion products on the character of energy release during a high-voltage discharge in liquid. EOM, no. 2, 1973, 68-71.

Kuchinskiy, V. G., V. T. Mikhkel'soo, and G. A. Shneyerson. Megaampere switch with exploding foil for studying magnetic cumulation. PTE, no. 3, 1973, 108-112.

Pokrovskiy, G. I. Vzryv. Izd. 3-ye. (Explosion.3rd edition). Moskva, Nedra, 1973, 182 p. (RZhMekh, 5/73, no. 5B186 K).

Rakhuba, V. K., and N. N. Stolovich. Optimizing the energy transfer process during electric wire explosion in liquid. ZhTF, no. 6, 1973, 1222-1227.

v. Equations of State

Berestov, A. T., M. Sh. Giterman, and N. G. Shmakov. Equation of state and isochoric heat capacity near critical point of liquids. ZhETF, v. 64, no. 6, 1973, 2232-2240.

Krestovnikov, A. N., I. A. Timoshin, and A. A. Kostryukova. Relation between pressure, temperature and composition during vaporization of variable composition phases in CdSe-CdTe systems. ZhFKh, v. 47, no. 6, 1973, 1400-1403.

Kuznetsova, T. I., D. B. Kazarnovskaya, A. Ya. Galitskiy and Ya. S. Kazarnovskiy. Equation of state for nitrogen-hydrogen-ammonia mixtures at high pressures and temperatures. Khimicheskaya promyshlennost', no. 2, 1973, 130-132. (RZhKh, 13/73, no. 13B744)

Miniovich, V. M., and G. A. Sorina. P-V-T-N sootnosheniya v razbavlennykh rastvorakh propana v etane vblizi kriticheskoy tochki etana. 2. Uravneniye sostoyaniya A. M. Rozena. Partsial'nyye mol'nyy ob'yemy etana i propana (P-V-T-N relationships in diluted propane solutions in ethane near the critical point of ethane. 2. A. M. Rozen's equation of state. Partial molar volume of ethane and propane). Moskva, 1973, 9 p. (RZhKh, 12/73, no. 12B858)

Yastrzhembskiy, A. L., and P. G. Makedonskaya. Various relationships for nitrogen, oxygen and hydrogen suitable for computer calculation. IN: Sbornik. Vopr. gidrodinamiki i teploobmena v kriogen. sistemakh, no. 2, Khar 1972, 41-46. (RZhKh, 13/73, no. 13L151)

vi. Miscellaneous Effects of Explosions

Azatyan, V. V., V. T. Gontkovskaya, and A. G. Merzhanov. Conditions for generating a thermal explosion during branching-chain reactions. FGiV, no. 2, 1973, 163-169.

Imenitov, V. R., N. A. Yevstropov, and A. A. Kuznetsov. Studying the effect of shielding during interaction of explosive waves. Fiziko-tekhnicheskiye problemy razrabotki poleznykh iskopayemykh, no. 3, 1973, 48-54.

Ispol'zovaniye yadernykh vzryvov dlya dobychi gaza. (Using nuclear explosions for gas extraction). Moskva, 1972, 98 p. (KL Dop vyp, 5/73, no. 10702)

Poyarkov, V. G., Ye. I. Popov, and Yu. A. Finayev. Explosive characteristics of industrial grade primary aluminum powders. VAN BSSR, seriya fiziko-energeticheskikh nauk, no. 2, 1973, 48-50.

Voytenko, A. Ye., Ye. P. Matochkin, and B. A. Yablochnikov. Using an explosive-magnetic generator to supply a gas discharge. PTE, no. 3, 1973, 177-178.

Zubkov, P. I., and L. A. Luk'yanchikov. Using explosives to interrupt heavy-current circuits. FGiV, no. 3, 1973, 453-455.

3. Geosciences

A. Recent Selections

AN SSSR. Institut fiziki Zemli. Zemletryaseniya v SSSR v 1969 godu (Earthquakes in the USSR in 1969). Moskva, Izd-vo Nauka, 1973, 226 p.

Golovkov, V. P. The geomagnetic field as an earthquake precursor? Zemlya i vselennaya, no. 3, 1973, 40-43.

Gorshkov, G. P., et al. Seismogeological conditions surrounding the origin of the 9 July 1968 Zangezur earthquake. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 77-81.

Guterch, A., et al. Preliminary results of deep seismic soundings on the southern part of international profile VII (in English). IN: PAN. Instytut geofizyki. Materialy i prace, no. 60, 1973, 53-62.

Hanyga, A. Detonations associated with phase transformations as a source of earthquakes (in English). IN: PAN. Instytut geofizyki. Materialy i prace, no. 60, 1973, 209-232.

Kukhtikova, T. I., and A. Ya. Barinova. Nonhomogeneity of the crust in the central sector of the northern region of the Tadzhik depression. IN: AN TadSSR. Doklady, v. 16, no. 5, 1973, 35-36.

Kulikov, V. M., and B. P. Sibiryakov. Elastic waves in two-dimensional, thin-layered media, as excited by a directional force source. Geologiya i geofizika, no. 5, 1973, 79-87.

·Kun, V. V., and G. S. Pod"yapol'skiy. Characteristics of seismic waves related to a finite-thickness layer. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 33-49.

Ladynin, A. V. Method of studying upper mantle discontinuities. Geologiya i geofizika, no. 6, 1973, 60-67.

Myachkin, V. I., and S. I. Zubkov. Composite graph of earthquake precursors. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 28-32.

Nikolayev, N. I. Artificial earthquakes. Priroda, no. 7, 1973, 2-17.

Polansky, J. Depth sections of the Czech massif. Geologicky pruzkum, no. 6, 1973, 161-167.

Proskuryakova, T. A., and V. G. Alkaz. Study of long-period microseisms in the 10 to 150 sec range. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 88-92.

Rybicki, K. Relationship between the focal mechanisms of an earthquake and that of its aftershocks in the light of the dislocation theory (in English). IN: PAN. Instytut geofizyki. Materialy i prace, no. 60, 1973, 197-207.

Shalimov, B. P. Experimental study of shear waves excited by a borehole explosion. Geologiya i geofizika, no. 6, 1973, 83-95.

Shtivel'man, V. I. Theoretical seismograms of Love waves in two-layered models of media. Geologiya i geofizika, no. 6, 1973, 68-82.

Sinitsyn, Ye. S. Criterion for detecting seismic signals of unknown shape. Geologiya i geofizika, no. 5, 1973, 88-95.

Teisseyre, R. Influence of local tectonic structure on seismic energy release (in English). IN: PAN Instytut geofizyki. Materialy i prace, no. 60, 1973, 181-196.

Teupser, Ch. An event-selecting seismograph system with digital recording (in English). Gerlands Beitrage zur Geophysik, v. 82, no. 2, 1973, 143-150.

Uchman, J. Results of deep seismic soundings along international profile V (in English). IN: PAN Instytut geofizyki. Materialy i prace, no. 60, 1973, 47-52.

Useynova, I. An atomic bomb recovers oil. Sputnik, no. 7, 1973, 12-14.

Uspenskiy, B. G., and V. M. Fremd. Compact long-period seismograph. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 82-87.

Vvedenskaya, A. V. Wave field of a propagating source in the form of a slip plane. IN: AN SSSR. Izvestiya. Fizika Zemli, no. 6, 1973, 11-27.

Wojtczak-Gadomska, B. Distribution of seismic energy released in the Aleutians-Alaska region and the relation with the dislocation flow (in English). IN: PAN. Instytut geofizyki. Materialy i prace, no. 60, 1973, 175-180.

Yegorkina, G. V., et al. Crustal structure of northwestern Armenia. Sovetskaya geologiya, no. 6, 1973, 80-91.

Zvyagintsev, L. I. Anisotropy of the elastic properties of rock in a stressed state. IN: AN SSSR. Izvestiya. Seriya geologicheskaya, no. 6, 1973, 46-53.

4. Particle Beams

A. Abstracts

Bugayev, S. P., F. Ya. Zagulov, Ye. A. Litvinov, and G. A. Mesyats. Volt-ampere characteristics of multi-edge diodes, operating in an explosive regime of electron emission. ZhTF, no. 3, 1973, 611-614.

An experimental investigation is made of the operation of cathodes consisting of a set of razor-shaped blades, arranged in parallel in an explosive regime of electron emission. The aim of the study was to determine the conditions at which observance of the "3/2" law should be expected for a diode having a cathode with numerous emitting centers. The volt-ampere characteristics were recorded and an investigation was made of the structure of the beam at accelerator voltages up to 300 kv and a pulse duration of 30 nanoseconds. The experimental apparatus is described.

The "3/2" law for a planar diode

$$I = 2.33 \cdot 10^{-6} u^{3/2} \frac{S}{d^2} \tag{1}$$

holds for the conditions

$$a \ll d, \quad vt \ll d, \quad d \ll r_0, \quad t_{ign.} \ll t_{pulse}, \tag{2}$$

where a is the distance between the axes of the emitting filaments, d is the distance between the cathode plane and the anode, $v = a/t$, r_0 is the initial radius of the cathode; $S = Nla$ is the area of the cathode, where N is the number of filaments, and l is the length of one filament.

During the experiment, conditions (2) were observed in a satisfactory manner. Radiograms were obtained which indicate the structure of the electron beam: at low voltage, electrons are emitted not from the entire cathode, but only from discrete parts of it; the value of the emission current

is described by the Childs-Langmuir law. To account for voltages to 500 kv, Eq. (1) is rewritten with account taken of relativistic effects:

$$i = 2.33 \cdot 10^{-6} u^{3/2} \frac{S}{d^2} \left[1 - \frac{3}{56} \left(\frac{eu}{mc^2} \right) + \frac{15}{1408} \left(\frac{eu}{mc^2} \right)^2 - \frac{3}{1024} \left(\frac{eu}{mc^2} \right)^3 \right], \qquad (3)$$

where m, e are the mass and the charge of an electron, c is the velocity of light. The volt-ampere characteristic of a pulse diode is presented. Current may increase due to the preliminary formation of plasma at the cathode prior to arrival of the main voltage pulse, as a result of explosion of the edges due to pre-pulses; this effect can cause an almost tenfold increase of the current in the diode.

Kazanskiy, L. N., and B. N. Yablokov. <u>Powerful nanosecond generator</u>. IN: Tr. 2-go vses. soveshch. po uskoritelyam zaryazhen. chastits, 1970, v. 1. Moskva, Nauka, 1972, 98-100. (RZhElektr, 1/73, no. 1A288)

A general description of the cited generator is presented, as well as its design calculations, the selection of its parameters, its design features, and operational results. The generator is designed for supplying the field emission electron gun of the ESU-1 accelerator with single pulses having the following parameters: voltage 2 Mv, current 5 kiloamperes, pulse rise time 12 nanoseconds, and pulse duration of 35 nanoseconds. The output pulse is formed by a dual shaping line which is charged by a Marks bank. A feature of the generator is its reduced dimensions. The generator uses a liquid polarized dielectric -- glycerin with high dielectric constant. The pulse of the double shaping line is transformer-coupled for decreasing the

line charge. The discharger of the double shaping line is connected between a ground electrode and high-voltage electrode, at the point where voltage is supplied to the high-voltage electrode from the voltage-pulse generator. This facilitates control of the discharger, and provides for cutoff of the voltage pulse generator from the electron gun and the double shaping line after commutation of the double shaping line. A schematic diagram of the generator is provided. The double shaping line consists of two lines, coupled together at the input of the transformer which is in the form of a smooth exponential coupling. The charge in the second line is effected via a helical short-circuit line. All components of the generator, including the voltage-pulse generator, are constructed coaxially; this permits the grounded electrode to be used as a shield, and minimizes edge effects.

Smiyan, O. D. Mechanism of processes taking place during treatment by electron beam. FiKhOM, no. 2, 1973, 3-9.

A study is reported on the initial stage of the fusion of metal by an electron beam. A new scheme of this process is proposed, which enables an explanation to be made both of the formation of the entire range of the various forms of the fusion of metal by an electron beam during welding, and of the various types of the treatment of materials by an electron beam (melting, welding, dimensional treatment, and evaporation).

The action of a focused electron beam on metal is as follows: an induced instantaneous internal point heat source is formed followed by isentropic expansion of the melt volume. Next, part of the liquid metal is forced out onto the surrounding colder metal; vapor-gas bubbles are formed, as well as a pulsating highly ionized plasma; part of the liquid metal is drawn

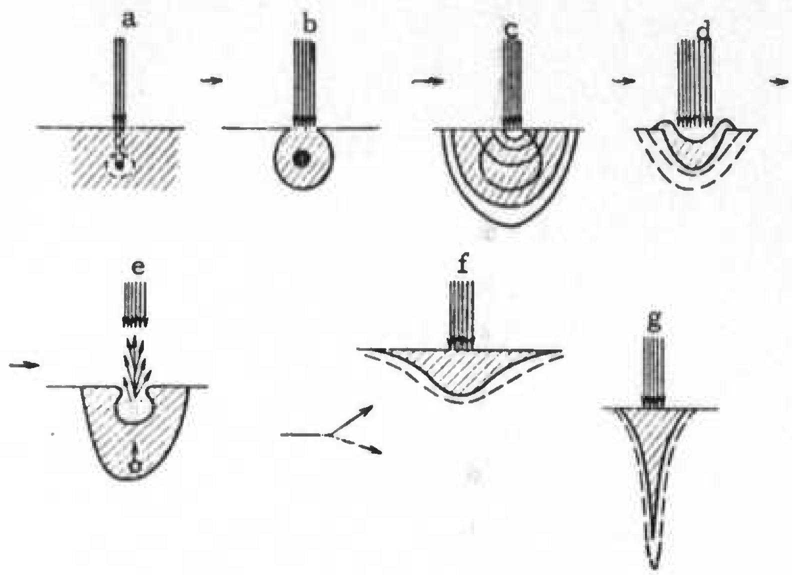

Fig. 1. General sequence of the interaction of a focused electron beam with metal. Shaded portions indicate liquid phase of the metal.

along by a thin plasma column, which originates in the center of the electron beam and bombards the cathode of the electron gun (see Fig. 1).

Depending upon the electron-treatment regime, the density and energy of the electron beam, and the thermophysical property of the target material, the role and significance of each of the enumerated factors change, and so does the relationship among them, as well as the thermal effect resulting from their combined action upon the metal. Fig. 2 shows crater formations in steel and nickel target specimens.

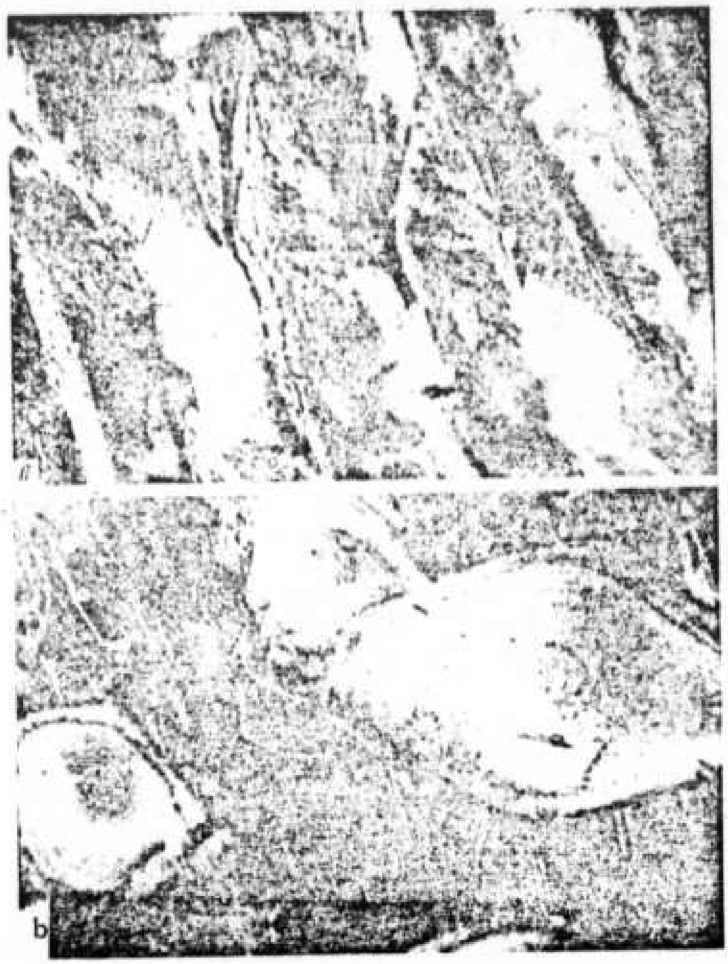

Fig. 2. External view of melt crater, x 40.

a- type Khl8N9T stell; b- Ni single crystal

Bredikhin, M. Yu., A. I. Maslov, Ye. I. Skibenko, and V. B. Yuferov. Heating of dense plasma with powerful electron beams. ZhTF, no. 3, 1973, 517-524.

A determination was made of time and functional relationships of the electron temperature, the mean ion energy and the amplitudes of superhigh-frequency oscillations induced in argon plasma to the parameters of a beam-plasma discharge within the magnetic field range of 10-35 koe in the center of the trap. The plasma was formed by interaction of an electron beam with a dense gas target; a description of the experimental equipment is given. The electron temperature of the plasma was determined by an X-ray technique and diamagnetic probes. Calorimetric measurements showed that the total power losses of the electron beam during passage through the plasma reach 50 - 60%. With an electron beam power of about 4 Mw, values of $T_e \gtrsim 3$ - 4 kev were obtained, with the temperature increase proportional to the input of energy into the plasma. The process of plasma heating is accompanied by intensive microwave radiation, the power of which is several orders greater than the level of thermal radiation. The amplitudes of the shf oscillations induced in the plasma were measured in relation to the current and energy of the electron-beam. It was established that the amplitude of these oscillations depends more upon the energy of the beam than upon its current.

On the basis of relationships of the current of neutral atoms arriving at the detector to the intensity of the magnetic field and the density of the neutral gas, the energy distribution of atoms emitted from the plasma was plotted for several values of the magnetic field. From comparison of experimental results with theory, the conclusion was drawn that the basic mechanisms causing heating of plasma electrons are cyclotron resonance and hybrid resonance. In the region of low density of the neutral gas, with $H_o \leq$ 10 koe, and small density gradients dN/dr, and when the electron plasma frequency is approximately equal to the electron cyclotron frequency, the

principal mechanism leading to the heating of plasma electrons is cyclotron resonance; under these conditions the contribution of hybrid resonance is of a limited nature. With a higher gas density and greater intensity of the magnetic field, when the electron plasma frequency is greater than the electron cyclotron frequency, the plasma heats up primarily owing to hybrid resonance. In this case, favorable conditions are realized for absorption of the oscillations induced in the plasma; these oscillations propagate against the magnetic field and attenuate in the plasma layer.

Yegorov, N. V., G. N. Fursey, and A. V. Kocheryzhenkov. Kinetic effects during field emission from high-resistance n-Si. FTT, no. 3, 1973, 892-894.

A study is made to determine whether the appearance of nonlinear volt-ampere characteristics during field emission from n-Si is accompanied by corresponding kinetic effects. Research was done on n-Si specimens with ρ = 10, 50, 300, 800, and 2000 ohm x cm. For specimens with ρ = 10 and 50 ohm x cm the v-a characteristics were linear, and no kinetic effects were manifested. For n-emitters with ρ = 300, 800, and 2000 ohm x cm kinetic effects appeared which were superficially analogous to those shown with p-Si. In all the cases where kinetic effects appeared in n-Si, the v-a characteristics had a saturation sector. The saturation current densities considerably exceeded those of the saturation currents observed at room temperatures for p-Si. For the specimen shown in Fig. 1 b, $j = 1 \times 10^4 a/cm^2$. The kinetic effects were manifested most clearly for n-Si specimens with ρ = 2000 ohm x cm, and it is for these specimens that the principal results are presented.

The typical form of oscillograms is presented in Fig. 1 a. As with p-Si, in region I of the v-a characteristics a lag in the appearance of the field-emission current is observed, in relation to start of the voltage pulse (Fig. 1 b).

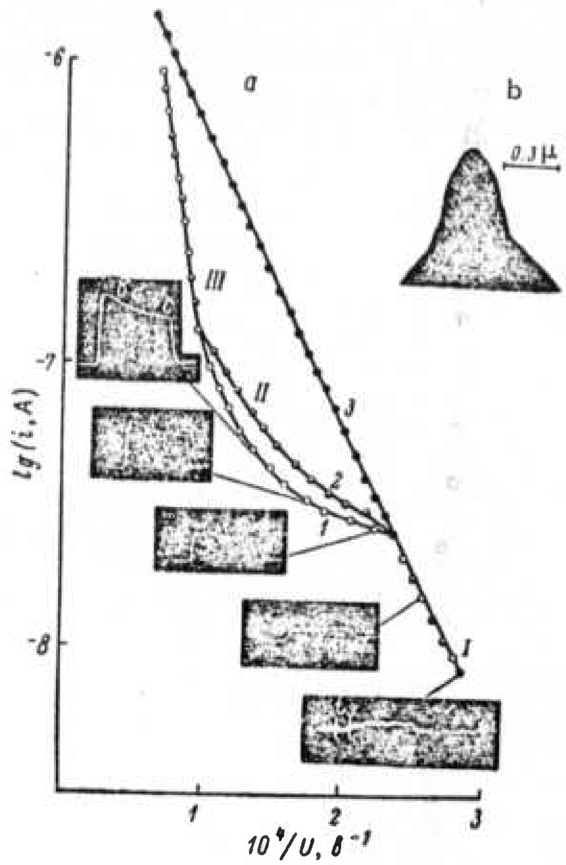

Fig. 1. Volt-ampere characteristics.

1 - steady-state; 2- constructed from current values in the quasi-steady sector at the end of a pulse lasting τ = 100 microseconds; 3 - constructed on the basis of current maximum. a- current waveforms; b- photomicrograph of a semiconductor field emitter. Time t_3 is the lag time of a current pulse in relation to cut-in of the voltage pulse.

In region II of the v-a characteristics (oscillogram in Fig. 1 a), the field emission current changes with respect to time in a manner very similar to that observed for p-Si specimens. Also typical is the appearance of a current maximum with a subsequent sharp decline (sector b), and slow relaxation (sector c). In distinction from p-Si specimens all the characteristic times, and particularly the time of slow relaxation, are considerably shorter. There is also a considerable difference in the ratios of the maximum current to the current at the end of the pulse (Fig. 2).

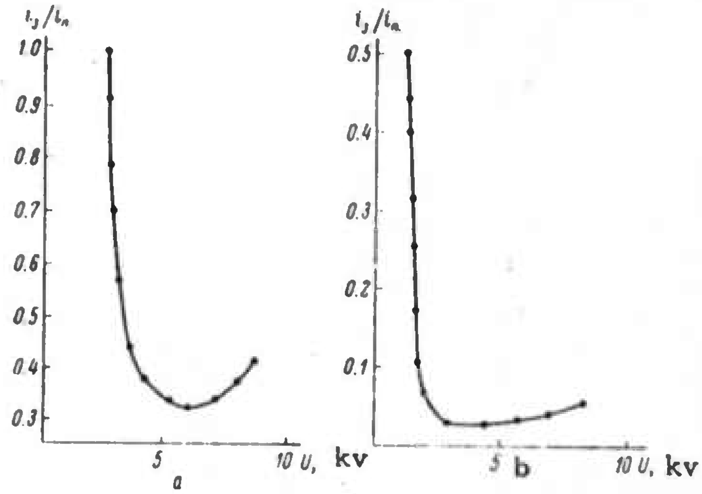

Fig. 2. Functions i_3/i_n-b (u), where i_n is the value of t'ie current in the region of the maximum and i_n is the value of the current at the quasi-steady sector at the end of a pulse with duration τ = 500 μsec for p-Si (a) and n-Si (b).

The quantitative differences of the kinetic characteristics observed for n-Si and p-Si specimens cannot be entirely explained by the effect of the surface states, and are apparently linked to processes within the volume of a semiconductor emitter.

Sinev, V. P. Thermal [illegible]fect of an electron beam on solids. FiKhOM, no. 2, 1973, 134-137.

A theoretical model is introduced of the thermal effect of a high-density electron beam on a solid. The model assumes the partial transfer of electron energy to the bulk material; in this case, the total thermal effect Q is the sum of simultaneous effects from the point source $q_1 = kQ$ near the solid surface and from a linear source $q_2 = (1-k)Q$ which can act to a depth δ below the surface (Fig. 1).

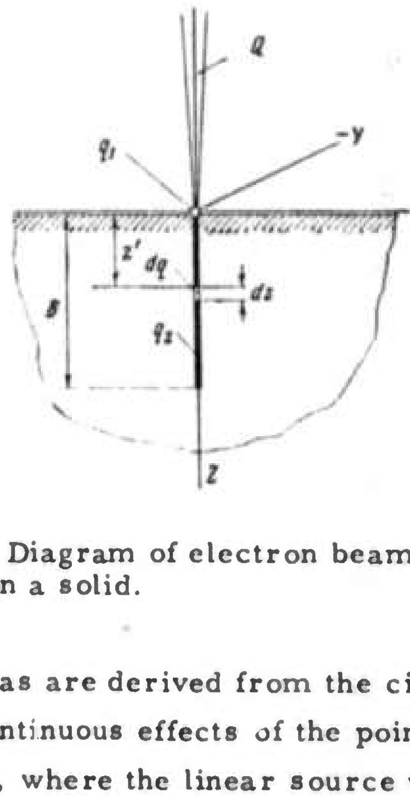

Fig. 1. Diagram of electron beam thermal effect on a solid.

Formulas are derived from the cited model for temperatures T_1 and T_2 from the continuous effects of the point and linear stationary sources, respectively, where the linear source was considered as the sum of instantaneous point sources dq_2. T_1 and T_2 are expressed as $f_1(R)$ and $f_2(r)$, respectively, where $R = \sqrt{x^2+y^2+z^2}$ and $r = \sqrt{x^2+y^2}$. The expressions of T_1 and T_2 are combined into one equation $T(x, y, z) = T_1 + T_2$ which gives temperature T of the stationary point M(x, y, z). Isotherms are plotted from

this equation for molybdenum heating with electron beams of different Q. The isotherms assume different shapes, depending on δ and the coefficient k of energy distribution. In agreement with experiment, e. g., electron beam welding, theoretical isotherms assume an approximate triangular shape when δ and q_2 are increased. In the case of electron beam welding, the approximate value of k was evaluated from experimental data to be 0.2-0.7 which is in agreement with the theoretical model.

Buts, V. A. Stability theory of an electron beam in an inhomogeneous dielectric medium. ZhTF, no. 3, 1973, 456-466.

Instability development of a homogeneous infinite electron beam during propagation through an inhomogeneous medium is studied theoretically. The mechanism of the beam instability development is similar to that described by Kurilko (DAN SSSR, v. 208, no. 5, 1973, 1059) for a homogeneous medium.

Only individual beam particles in an inhomogeneous medium emit transient radiation instead of Cerenkov waves. Calculations by two independent methods show that transient radiation generates a beam instability whose increment γ is proportional to radiation magnitude from an individual particle, and beam density ω_b. The practically important problem is solved of beam propagation along a metallic waveguide of radius a which is located in a strong magnetic field ($\omega_H \geq \omega$, ω_b) and is filled with a periodically inhomogeneous plasma. Propagation of an electron beam in such a system increases the amplitude of both longitudinal and transverse waves; conditions for oscillation rise are formulated for both the nonrelativistic and relativistic cases. These show that the plasma inhomogeneity period at a high beam propagation velocity ($v_o \sim C$) is significantly longer than at a low v_o. This

result is explained by the shift of transient radiation peak toward shorter waves, when particle velocity is increased. The width of the instability region increases, together with γ, when beam modulation index is increased.

It is shown that in the system under study transverse waves can also develop under certain conditions. Thus a direct amplification of transverse waves by an electron beam may be feasible in amplifiers and oscillators without conversion of the beam longitudinal oscillations into transverse e-m waves. Buildup of longitudinal oscillations in the nonrelativistic case is described without accounting for the transverse waves effect. In contrast, rise of both longitudinal and transverse waves in the relativistic case is described adequately only with allowance for the interaction between the two kinds of waves.

Gorelik, G. Ye., N. V. Pavlyukevich, T. L. Perel'man, and G. I. Rudin. Melting of a semi-infinite body from an internal point heat source. IFZh, v. 24, no. 3, 1973, 525-532.

Liquid phase formation and melting front propagation in a semi-infinite body from the effect of an electron beam are analyzed, using the approximation of a point internal heat source. Solution of the symmetrical Stefan problem by the method of successive iterations led to the conclusion that nonstationary heat conductivity is the main determinant of melting front propagation during a dimensionless time $\tau \geq 1$. A formula is derived for the melting zone radius r_1 in a semi-infinite body, which shows the effect of a flat free surface on melting front propagation.

Solution of the spherically symmetric problem for a real three-dimensional heat source shows that source distributivity b must be taken into account at $\bar{r}/b \leq 1$, where $\bar{r}$ is the maximum melt radius for a point source. Formulas are also derived for the melt pressure and radius of the plasticity region as functions of stress field components which determine time of melt ejection.

Kovalenko, V. P. Observing feedback in a plasma-electron beam system. UFZh, no. 3, 1973, 514-515.

In a study on electron beam-plasma interaction, a positive feedback from an argon plasma-beam interaction to the beam at its entrance to the plasma was observed, in the absence of an external source of modulation, e.g. a magnetic field. The feedback was evidenced by fairly regular beam oscillation at the entry point, at a frequency equal to that of oscillations recorded in the nonlinear interaction region (meniscus). There is a breakdown in oscillations in the absence of meniscus. It is shown that interposition of a high-frequency tunable resonator at the beam entrance does not significantly affect oscillation excitation, since oscillations at the meniscus are nearly independent of tuning. In these experiments the resonator acted as a measuring instrument only. Thus the existence of feedback, and hence beam modulation from the feedback, is confirmed experimentally. It is noted that regularity of beam oscillations is a prerequisite for bunching.

Yurike, Ya. Ya., V. F. Puchkarev, and D. I. Proskurovskiy. <u>Appearance of luminescence between electrodes during spark current rise time in a vacuum breakdown at constant voltage</u>. IVUZ Fiz, no. 3, 1973, 12-16.

New experimental data were obtained in support of an earlier assumption by two of the authors that the breakdown at constant voltage of a narrow vacuum gap is initiated by an explosion-like appearance of cathodic flares (February 1972 Report, p. 112). In experiments similar to those described in the cited study, times were determined of luminescence appearance directly in front of the cathode and anode, as well as in the center of the interelectrode gap, and were compared with the onset of the spark current rise. Luminescence was recorded with a photomultiplier with ~3 nsec. time resolution. The experimental data of both constant and pulsed voltage breakdowns revealed that only luminescence at the cathode appears simultaneous with the onset of current rise. Confirmation was thus obtained of the earlier assumption that in all breakdown cases studied, irreversible breakdown of vacuum insulation is caused by the explosion-like onset of cathodic flares.

Rosinskiy, S. Ye., and V. G. Rukhlin. <u>Magnetic and charge neutralization of an electron beam injected in magnetically-active plasma</u>. ZhETF, v. 64, no. 3, 1973, 858-867.

The behavior of a cold magnetically-active plasma following injection of a low-density electron beam parallel to an external magnetic field is examined with ion effects taken into account. The magnetic and charge neutralization effects are emphasized. Asymptotic formulas for the beam-induced electromagnetic fields, counter-current and charge density are derived by a method described earlier (ZhETF, v. 61, 1971, 177). The

cited formulas are analyzed in the cases of a weak ($\Omega_i \leq \nu_i$) and a strong ($\Omega_i \geq \nu_i$) magnetic fields, where Ω_i and ν_i are ion gyrofrequency and collision frequency, respectively. In the former case, diffusion length z' is the same as in nonmagnetized plasma, but the width of the ring layer which contains the fields and currents increases under the condition of magnetic neutralization. Radial dependence of the azimuthal magnetic field $B_\varphi(r)$ within the ring layer becomes quasiperiodical when B_φ intensity is increased. When $\Omega_i \geq \nu_i$, the ion effect becomes significant; z' then decreases relative to that in a non-magnetized plasma. Conditions are also formulated for the absence of magnetic and charge neutralization. In that case, any forward beam current through the plasma in excess of the Alfv'en current becomes impossible.

Pustovalov, V. V., V. P. Silin, and V. T. Tikhonov. A quasilinear theory of parametric instability of a magnetoactive plasma. ZhETF, v. 64, no. 3, 1973, 848-857.

The article considers the theory of parametric resonance - a quasilinear relaxation theory of a parametrically excited plasma, located in a constant and homogeneous magnetic field. The quasilinear theory of the magnetoactive plasma irradiated by an intensive electron beam is developed by means of equations for pair correlation functions of plasma particles. The equations are solved for the case of low electron oscillation amplitude in the pumping wave field. It is shown that quasilinear parametric saturation of the increasing noise of a magnetically active plasma in a weak pumping field occurs owing to deformation of the electron distribution function in a comparative narrow epithermal velocity interval, when the heating effects may be neglected. Time variations are derived for parametric oscillation growth, spectral energy density of parametrically excited plasma excitations, and electron distribution function. A significant number of fast electrons is observed, i.e, about 0.1 percent of the total number.

Zakatov, L. P., A. S. Kingsep, and A. G. Plakhov. Experimental observation of nonlinear stabilizing of electron beam instability in plasma. ZhETF P, v. 17, no. 6, 1973, 280-284.

Under the conditions of most plasma-beam experiments, the main nonlinear process is the scattering of Langmuir waves on plasma ions. While stimulated scattering under conditions of weak turbulence has up to now not been observed experimentally, a number of effects exist which can be explained by means of such a process. In the described experiments, the condition was adhered to wherein the main nonlinear effect, namely the scattering of waves on ions, results in the reflection of a wave with an insignificant loss of momentum.

If two electron beams are injected into a plasma opposite one another, and the energy of each of them is subject to the condition for wave reflection with insignificant momentum loss, the more energetic beam generates a noise regime in the plasma which effectively stabilizes the second beam. Since the electron temperature (and particularly the ion temperature) is determined rather imprecisely in plasma-beam experiments, the energy difference which corresponds to optimum stabilization must be selected experimentally.

A description of such an experiment is given, together with a schematic diagram. Electron guns EG-1 and EG-2 were situated at opposite ends of the vacuum vessel. The beam currents and the beam energy could be varied within wide limits, so that optimal operating regimes could be selected. The current pulses of EG-1 were 250 microseconds in duration, and those of EG-2 were 130 microseconds. EG-1 and the plasma injector were turned on simultaneously, and EG-2 went off with a lag of 100 or 300 μsec. The 100 μsec lag permitted the beam of EG-2 to be injected into the plasma with a high degree of oscillations induced by the beam of EG-1, and the 200-microsecond lag provided for injection of the beam of EG-2 in the presence of thermal noises.

Direct observation of the stabilization effect of a beam in plasma was conducted by means of measurement of the distribution functions of the beam particles vs. longitudinal energies. Two beams were injected into cold hydrogen plasma along the magnetic field, counter to one another, in the above-indicated time sequence. At equal fixed currents of the two beams, the optimal relationship was found between the energies of the stabilizing beam and the test beam. It was determined that the stabilization effect is most clearly expressed when the beam energies are similar and the energy difference does not exceed (1 - 2) kev at a stabilizing-beam energy of 13 kev and currents of 10 a.

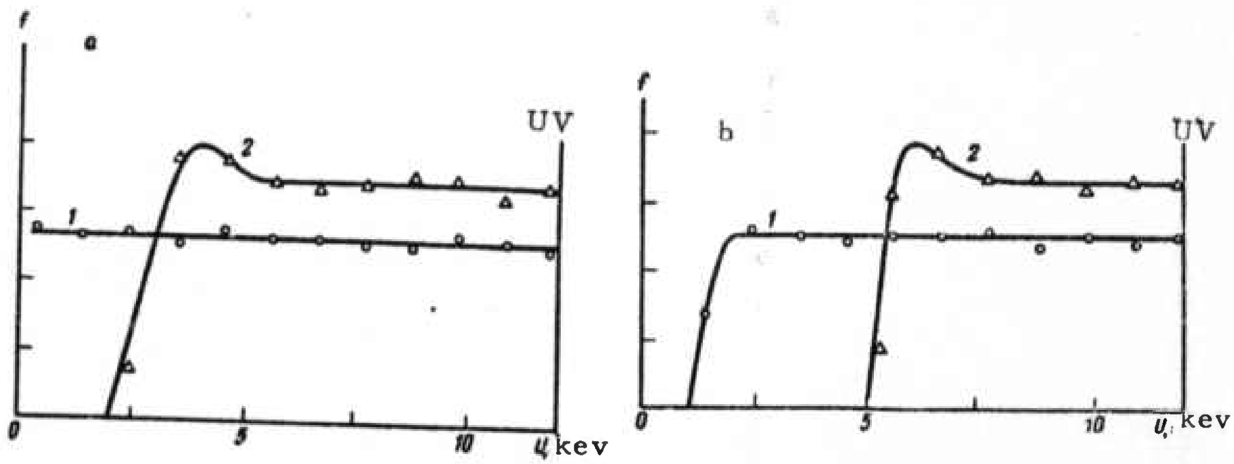

Fig. 1. Distribution functions of electrons vs longitudinal energies in the test beam at plasma outlet. a) curve 1- without a stabilizing beam; curve 2- with a stabilizing beam. The current of the test beam is 8 a, the energy is 12 kev, the current of the stabilizing beam is 8 a, the energy is 13 kev; b) same, for a test-beam current of 5 a.

Shown in Fig. 1 a (curve 1) is the distribution function in the test beam of EG-2 at the plasma outlet in the absence of the EG-1 stabilizing beam. The distribution has the usual form of a plateau all the way to zero

energies. With simultaneous passage of the two beams, the distribution function changes: the beam is less "diffused" with respect to the energies, i.e., it is stabilized (curve 2). Decreasing the current of the test beam gives better stabilization, as seen in Fig. 1 b.

Measurements of plasma diamagnetism have shown a considerable decrease in the effectiveness of heating from the test beam in the presence of the stabilizing beam. The stabilization effect is noted to a large degree on the diamagnetic signal, since in this case average values are measured for the entire volume of the trap, and nonfulfillment of the stabilization conditions in individual local zones, as well as "diffusion" of the beam prior to entry into the trap, are in this case insignificant.

Vyatskin, A. Ya., V. V. Trunev, and Kh.-I. Fitting. Penetration of 0.5-4 Kev electrons through thin films of various metals. RiE, no. 2, 1973, 432-434.

Earlier studies have been made on the integral characteristics of the penetration, reflection, and absorption of electrons with initial energies of E_O = 4-30 kev in thin films of some metals and semiconductors (Al, Cu, Au, Ge, Si). General empirical relationships have been established which describe the integral coefficients of penetration η and reflection r as a function of the film thickness and the initial energy:

$$\eta = \exp[-\alpha x^p], \quad (1)$$

$$r = r_0\{1 - \exp[-\mu x^p]\}. \quad (2)$$

where α and μ are coefficients which depend upon the initial energy and the

substance, r_O is the coefficient of reflection in the case of a massive specimen; parameter p does not depend upon the initial energy and is determined by the properties of the substance.

The present paper presents the results of a simultaneous study of the characteristics of penetration, reflection, and absorption of electrons with the initial energies of 0.5-4 kev in aluminum and beryllium, by the method of leakage through of thin films measuring in the range of 150-3000 Å. The experimental procedure is briefly described. Measurements were conducted in a working vacuum of 5×10^{-8}-10^{-7} torr. The primary functions $\eta(E_O)$, $r(E_O)$, and $\gamma(E_O)$ were obtained in the films (γ -- absorption). The primary functions were converted to a set of curves $\eta(x)$, $r(x)$, and $\gamma(x)$ on the basis of the law of charge conservation, $r + \gamma + \eta = 1$. In Fig. 1 these

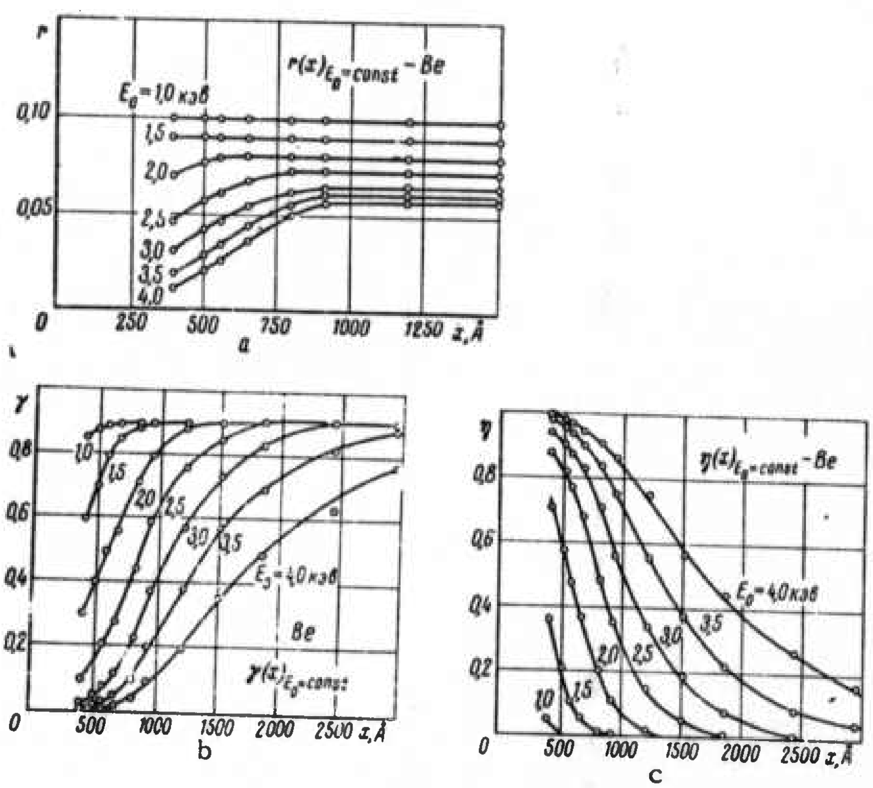

Fig. 1. Relationship of the coefficients of reflection r, absorption γ and penetration η to film thickness x for Be: a- r; b- γ; c- η.

curves are presented for Be. Within the range of small thicknesses (up to 400-600 Å) and at initial energies of 3-4 kev, almost a complete absence of electron absorption is noted, and only a redistribution of coefficients η (x) and r(x) occurs in accordance with the equation $\eta + r = 1$. This indicates a considerable degree of electron scattering and reflection, and the relatively small role of deceleration.

An analysis of η (x) and r (x) for Al and Be showed that they are reasonably closely described by Eqs. (1) and (2), but with changing values of p. Values of the experimental parameters p, α, and μ are given by the authors in tabular form.

Hence the relationships (1) and (2), established previously within the energy range of 4-30 kev, may be used for describing the characterist of penetration and absorption within the range of 0.5-4 kev, if account is taken of the change of parameter p and the relationship of the reflection coefficient r_O to the initial energy.

B. Recent Selections

Abu-Asali, Ye., B. A. Al'terkop, R. D. Dzhamalov, and A. A. Rukhadze. Nonlinear ionic surface oscillations in a semiconfined current-carrying plasma. ZhETF, v. 64, no. 6, 1973, 2051-2056.

Bazhenov, G. P., Ye. A. Litvinov, G. A. Mesyats, D. I. Proskurovskiy, A. F. Shubin, and Ye. B. Yankelevich. Metal influx into the cathode flare during explosive emission of electrons from metallic points. Part 1. Initial explosion of points with typical geometry of the field emitters. ZhTF, no. 6, 1973, 1255-1261.

Bazhenov, G. P., Ye. A. Litvinov, G. A. Mesyats, D. I. Proskurovskiy, A. F. Shubin, and Ye. B. Yankelevich. Metal influx into the cathode flare during explosive emission of electrons from metallic points. Part 2. Multiple pulsing of current. ZhTF, no. 6, 1973, 1262-1268.

Borisov, D. G., and A. I. Gryzlov. Pulsed supply system for a linear accelerator. Author's certificate, USSR, no. 300136, published June 13, 1969. (Otkr izobr, 19/73, p. 19).

Bykov, A. P. A linear electron accelerator. Author's certificate, USSR, no. 317351, published June 28, 1972. (RZhElektr, 5/73, no. 5A291 P)

Chesnokov, V. V. A field-emission cathode. Author's certificate, USSR, no. 339986, published August 16, 1972. (RZh Elektr, 5/73, no. 5A27 P).

Drobyshevskiy, E. M., Yu. A. Dunayev, and S. I. Rozov. Ring discharges in electrolytes. ZhTF, no. 6, 1973, 1217-1221.

Fal'kovskiy, N. I. Controlled plasma-jet discharger for commutation of high pulsed currents. PTE, no. 3, 1973, 112-114.

Golov, A. A., G. N. Fursey, I. D. Ventova, A. D. Lebedev, and S. A. Valuyskiy. Comb-type field emitter. Author's certificate, USSR, no. 342241, published June 29, 1972. (RZh Elektr, 5/73, no. 5A26 P)

Manzyuk, N. A., V. L. Sizonenko, K. N. Stepanov, V. A. Suprunenko, Ye. A. Sukhomlin, and A. M. Ternopol. Electrical conductivity of plasma during collective interactions in a heavy-current gas discharge. IN: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza. Resp. mezhved. sb., no. 4, 1973, 15-20.

Manzyuk, N. A., V. A. Suprunenko, Ye. A. Sukhomlin, and A. M. Ternopol. Effectiveness of current heating in the dense plasma of a heavy-current gas discharge. IN: ibid. 20-27.

Orlovskiy, V. M., Yu. D. Korolev, Yu. A. Kurbatov, Yu. I. Bychkov, V. F. Tarasenko, and A. P. Khuzeyev. A high-voltage nanosecond pulse generator. PTE, no. 3, 1973, 107-108.

Suprunenko, V. A., Ye. A. Sukhomlin, and V. T. Tolok. Current heating of a dense plasma during collective interactions in a heavy-current gas discharge. IN: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza. Resp. mezhved. sb., no. 4, 1973, 5-15.

Zablotskaya, G. R., B. A. Ivanov, S. A. Kolyubakin, A. S. Perlin, V. A. Rodichkin, and V. B. Shapiro. The REP-5 pulsed heavy-current accelerator of relativistic electrons with a 50 ka beam current. Atomnaya energiya, v. 34, no. 6, 1973, 471-474.

Zelenin, G. V., A. A. Kutsyn, M. Ye. Maznichenko, O. S. Pavlichenko, and V. A. Suprunenko. Measuring turbulent high-frequency fields in a heavy-current linear gas discharge by the intensity of HeI forbidden lines. IN: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza. Resp. mezhved. sb., no. 4, 1973, 203-208.

5. Material Sciences

A. Abstracts

Sokolova, T. V., Ye. Ya. Litovskiy, T. B. Buzovkina, and S. S. Bartenev. Analysis of microstructural parameters effect on thermal conductivity of porous ceramic materials. NM, no. 2, 1973, 296-300.

Effects of different microfissility parameters on the effective thermal conductivity λ_{eff} of porous ceramics are calculated from the formula

$$\lambda_{eff} = M\lambda_o \quad (1),$$

where λ_o is the calculated thermal conductivity of a porous material without allowance for microcrack effects, and M is the corrective factor. In calculation of M, the dimensionless parameters defining microcrack dimension, λ_m and λ_s of intergranular material and gas gap, respectively, and intergranular contact area, are taken into account. The calculated plots show M dependence on the cited parameters. The theoretical data were used to evaluate the effect of microstructural parameters on λ_{eff} of the plasma sputtered coatings of analytical and spectral grade alumina. Comparison of the theoretical and experimental high-temperature dependences of λ_{eff} for alumina shows that introduction of M narrows the discrepancy between these two sets of data to 100% in contrast to a 500% discrepancy without this correction.

Popolitov, V. I., and A. N. Lobachev. High temperature and pressure interactions of Sb-Te-I-R-H_2O systems (R = solvent). NM, no. 2, 1973, 210-212.

Hydrothermal synthesis was studied of photoconductive and piezoelectric single crystals in the cited system at 290-450° C with a 15-40° C vertical temperature gradient, and under pressure in the 200-2000 atm. range. The ratios of the Sb, Te, and I reactants and R = HI, HCl, or C_2H_5OH concentrations were varied in the experiments. Crystallization regions were determined for Sb-Te-HI-H_2O; Sb-Te-HI-I-H_2O; Sb-Te-HI-HCl-H_2O; and Sb-Te-I-C_2H_5OH-H_2O systems. Single crystals of SbTeI, Sb_2Te_3, Sb, Te, and SbI_3 were obtained in variable yields, depending on the ratio of reactants and R concentration. Crystallization rate in the Sb-Te-I-H_2O system is increased by addition of ethyl alcohol as solvent. It was established that temperature, temperature gradient, and pressure variations within the cited ranges do not affect phase formation. The first two factors, however, increase the crystallization rate.

Uglov, A. A. Seminar on the physics and chemistry of materials processing using concentrated energy fluxes, April 25, 1972. FiKhOM, no. 1, 1973, 158-159.

A brief summary is given of some ten papers presented at the 35th Seminar on the title subject, held at the Baykov Institute of Metallurgy under the chairmanship of Academician N. N. Rykalin. Over 80 Soviet researchers from different institutions participated in the proceedings. The principal topic of the papers and the subsequent discussions was development of solutions to nonlinear and linear heat and mass transfer problems.

A paper by V. V. Salomatov and A. D. Gorbunov (Tomsk) dealt with analysis of high-temperature heating and surface destruction of materials. The authors applied their own method of quasistationary approximation to solve the problem of material ablation from a variable heat flux. They derived sufficiently accurate formulas for engineering calculations of ablation.

I. V. Zuyev and A. A. Uglov (Moscow) reported on fluctuations of the melt depth during electron-beam welding with a dagger-shaped melting zone. Evaluation of the electron beam-metal vapor interaction indicated a pulsed type interaction, even with a continuous beam.

Electron-beam melting was also the subject of an experimental study by E. V. Farber et al, who obtained data relating the temperature field of a molten bath mirror to melting parameters.

B. Recent Selections

i. Crack Propagation

Borisova, Ye. A., I. I. Shashenkova, and R. D. Glebova. Sensitivity of some titanium alloys to cracks. IN: Sbornik. Struktura i svoystva titanovykh splavov, 1972, 154-160. (RZh Metallurgiya, 6/73, no. 6I393)

Bravinskiy, V. G., and M V. Osipov. Crack development in ceramic materials. F-KhMM, no. 3, 1973, 80-82.

Edmondson, B., K. Formbi, and M. Stegg. Investigating fracture resilience. IN: Sbornik. Novyye metody otsenki soprotivleniya met. khrupkomu razrusheniyu, Moskva, Mir, 1972, 245-255. (RZh Mekh, 5/73, 5V547).

Finkel', V. M., L. N. Muratova, and V. P. Ivanov. Effect of slip band on crack propagation. FTT, no. 6, 1973, 1917-1919.

Finkel', V. M., V. V. Chernyy, and Yu. I. Golovin. Branching of brittle cracks. IN: Sbornik. Konstruktivn. prochnost' staley i splavov i metody yeye otsenki. Moskva, 1972, 48-49. (RZh Mekh, 5/73, no. 5V543)

Finkel', V. M., Yu. A. Brusentsov, V. Ye. Sereda, G. B. Muravin, Yu. I. Tyalin, and V. A. Dobkevich. Interaction of stress waves with cracks. IN: Tr. Mosk. in-ta. khim. mashinostr, no. 44, 1972, 65-75. (RZh Mekh, 5/73, no. 5V545)

Kanazava, T., S. Machida, S. Momota, and I. Nagivara. Studying initiation of brittle fracture on the basis of crack opening concept. IN: Sbornik. Novyye metody otsenki soprotivleniya met. khrupkomy razrusheniyu. Moskva, Mir, 1972, 90-106. (RZh Mekh, 5/73, no. 5V555)

Kolachev, B. A., A. V. Mal'kov, and V. I. Sedov. Effect of hydrogen on fracture micromechanism of OT4 and OT4-1 titanium alloys. F-KhMM, no. 3, 1973, 59-64.

Kuliyev, V. D. Steady state movement of cracks in a strip. PMM, no. 3, 1973, 572-576.

Kunin, I. A., G. N. Mirenkova, and E. G. Sosnina. Ellipsoidal crack and needle in an anisotropic elastic medium. PMM, no. 3, 1973, 524-531.

Litvak, V. I., and N. V. Baranov. Detectors of fatigue cracks. ZL, no. 6, 1973, 751-753.

Markochev, V. M., V. Yu. Gol'tsev, and A. P. Bobrinskiy. Determining critical opening of cracks during testing of compact specimens. IN: Sbornik. Konstruktivn. prochnost' staley i splavov i metody yeye otsenki. Moskva, 1972, 41-43. (RZh Mekh, 5/73, no. 5V553)

Pavlov, P. A., and S. Zhunisbekov. Effect of artifical crack-type macroscopic defects on the resistance of polyvinylchioride in a planar stressed state. IN: Sbornik. Tekhn. nauki, no. 12. Alma-Ata, 1972, 94-99.

Zhunisbekov, S. Effect of artificial crack-type macroscopic defects on tensile strength of a polyvinylchloride sheet. IN: Sbornik. Tekhn. nauki, no. 2. Alma-Ata, 1972, 89-94. (RZh Mekh, 5/73. no. 5V1350)

ii. High Pressure Research

Berzon, E. M. Studying interaction of Armco iron with a pressure-transmitting medium at high pressures and temperatures. FiKhOM, no. 3, 1973, 146-149.

Brekhovskikh, S. M., V. A. Tyul'kin, and I. N. Polandov. EPR study of irreversible structural changes in alkali-silicate glasses under high pressures. NM, v. 9, no. 6, 1973, 1021-1026.

Galkin, A. A., V. M. Svistunov, O. I. Chernyak, and M. A. Belogolovskiy. Effect of pressure on the phonon impurity band of Pb-In alloy. DAN SSSR, v. 210, no. 4, 1973, 815-817.

Glyuk, D. S., and V. N. Anifilogov. Phase equilibrium in the granite-H_2O-KF system at a 1000 kg/cm^2 steam pressure. DAN SSSR, v. 210, no. 4, 1973, 938-940.

Karpenko, I. V., V. B. Primisler, and V. P. Saak'yants. Effect of molybdenum disulfide solid lubricants on plastic deformation of the surface layer of steel during hydrostatic compression. FiKhOM, no. 3, 1973, 96-99.

Korolev, V. I. Pulse amplitude in a high pressure corona [neutron] counter. PTE, no. 3, 1973, 77-78.

Korsunskaya, I. A., D. S. Kamenetskaya, and T. P. Yershova. Calculating T-P-C phase diagram of the Fe-C system in equilibrium with melt at pressures to 100 kbar. DAN SSSR, v. 210, no. 3, 1973, 577-580.

Larionov, E. G., and P. A. Kryukov. Equivalent electric conductance of KCl at infinite dilution at temperatures to 150° C and pressures to 8000 kg/cm^2. IAN SO SSR, seriya khimicheskikh nauk, v. 7, no. 3, 1973, 104-111.

Laukhin, V. N., A. G. Rabin'kin, and E. I. Estrin. Phase transition in KCl under pressure and at low temperatures. ZhETF, v. 64, no. 6, 1973, 2273-2276.

Protopopov, V. S., I. V. Kurayeva, and A. M. Antonov. An approach to determining conditions of heat exchange regime deterioration at supercritical pressure. TVT, v. 11, no. 3, 1973, 593-597.

Richter, H. Hardening fcc-metals and alloys with a low energy of packing defect from the effect of high dynamic pressures and at high loading velocities. Wiss. Z. Techn. Hochsch. O. Guericke Magdeburg, v. 16, no. 5, 1972, 479-485. (RZh Metallurgiya, 6/73, no. 6I354)

Semenova, A. I., S. S. Tsimmerman, and D. S. Tsiklis. Molar volume of Freon-13 at high pressures and temperatures. ZhFKh, no. 6, 1973, 1537-1539.

Shirokov, A. M., Yu. V. Kosichkin, V. B. Anzin, Ye. S. Itskevich, and V. A. Sukhoparov. Low-temperature and fixed-hydrostatic pressure chamber for optical studies. PTE, no. 3, 1973, 208-209.

Voloshin, V. A., L. K. Mashkov, and V. G. Tishchenko. Effect of pressure on optical properties of europium benzoylacetonate. UFZh, v. 18, no. 6, 1973, 988-993.

Yeremeyev, A. Ye. Using radial compression of a thick-walled tube for high pressure measurements. IT, no. 6, 1973, 43-44.

iii. High Temperature Research

Andrushchenko, N. S., V. N. Parfenenkov, and R. G. Grebenshchikov. Micro-x-ray spectral investigation of solid solutions in the Y_2O_3-HfO_2-SiO system. ZhPK, no. 6, 1973, 1340-1342.

Apshteyn, E. Z. Certain ablation characteristics of a vitreous body in a hot gas streamline flow. MZhiG, no. 3, 1973, 181-184.

Arabey, B. G., V. S. Loskutov, O. D. Melimevker, Ye. V. Mel'nikov, V. G. Saksel'tsev, and Yu. V. Smirnov. Certain characteristics of samarium oxide plasma sputtering. Poroshkovaya metallurgiya, no. 6(126), 1973, 87-90.

Aslanova, M. S., and S. I. Kostareva. Obtaining new types of heat-resistant leached fibers of the SiO_2-Al_2O_3-B_2O_3-Na_2O glass systems and investigation of their structure. IN: Sbornik, Mekh. i teplovyye svoystva i stroyeniye neorgan. stekol. Moskva, 1972, 291-294. (RZhKh, 12/73, no. 12B620).

Bondarenko, V. P., L. A. Dvorina, Ye. N. Fomichev, N. P. Slyusar' and A. D. Krivorotenko. Experimental study of the enthalpy of hafnium and rhenium disilicides at high temperatures. Moskva, 1972, 8 p. (RZhKh, 11/73, no. 11B683).

Chukanova, L. A., and A. S. Nevskiy. Experimental investigation of radiation and absorption properties of carbon dioxide at nonuniform high temperatures. IN: Sb. nauch. tr. VNII metallurgich. teplo-tekhn. no. 4, 1973, 5-13. (RZhKh, 13/73, no. 13I19)

Drozd, N. P., G. G. Maksimovich, S. M. Kudlak, and V. S. Baranetskiy. Multiple-position tensile testing machine for materials testing at high temperatures in vacuum or a gaseous medium. F-KhMM, no. 3, 1973, 120-121.

Gerasimov, Ya. I., I. A. Vasil'yeva, Zh. V. Granovskaya, and A. F. Mayorova. Thermodynamic properties of nonstoichiometric zirconium dioxide in 1173-1373° K temperature interval. DAN SSSR, v. 210, no. 6, 1973, 1347-1349.

Gluzberg, Ye. I. Heat- and mass-transfer in a porous medium with distributed sources. IAN Kaz, seriya fiz. mat., no. 3, 1973, 69-71.

Gulayev, V. M., K. I. Ryabtsev, V. S. Bakunov et al. Strength and deformation characteristics of quartz glass. Steklo i keramika, no. 6, 1973, 14-16.

Kulish, A. A., R. P. Yurchak, and M. M. Mebed. Device for measuring thermal diffusivity of current conducting materials at high temperatures. VMU, no. 2, 1973, 233-235.

Kul'varskaya, B. S., and N. Ya. Cherevatskiy. Auger electron spectroscopy of the carbide thermionic emitter surfaces. ZhTF, no. 6, 1973, 1303-1304.

Magaril, R. Z. Mechanism and kinetics of pyrocarbon formation. IN: Sbornik. Khimiya i khim. tekhnol. Tyumen', 1972, 132-155. (RZhKh, 12/73, no. 12B1090)

Magaril, R. Z. Mechanism and kinetics of pyrocarbon formation. IN: ibid., 156-158. (RZhKh, 12/73, no. 12B1091)

Matveyeva, F. A., and T. F. Melekhova. Interaction of zircon with aluminum oxide at high temperatures. IN: Sbornik. Fiz.-khim. issled. alyumosilikat. i tsirkoniysoderzh. sistem i materialov. Novosibirsk, izd-vo Nauka, 1972, 222-229. (RZhKh, 11/73, no. 11B780).

Nayborodenko, Yu. S., V. I. Itin, A. G. Merzhanov, I. P. Borovinskaya, V. P. Ushakov, and V. P. Maslov. Gas-free burning of metal mixtures and self-sustaining high-temperature synthesis of intermetallides. IVUZ Fiz, no. 6, 1973, 145-146.

Nikitin, V. I. Calculating high-temperature corrosion resistance of metals at variable temperature. F-KhMM, no. 3, 1973, 49-53.

Novikov, I. I., and I. P. Mardykin. Thermal properties of lanthanides at high temperatures. TVT, v. 11, no. 3, 1973, 527-532.

Ovsyannikov, B. M., and A. A. Khlopotin. Methods of high-temperature mechanical testing and strength estimates of composite materials. IN: Sbornik. Spets. stali i splavy, no. 1, Moskva, izd-vo Metallurgiya, 1972, 126-132. (RZh Metallurgiya, 6/73, no. 6I851)

Polezhayev, Yu. V. Yu. G., Narozhnyy, and V. Ye. Safonov. Method of determining coefficient of thermal conductivity of high-temperature materials during nonstationary heating. TVT, v. 11, no. 3, 1973, 609-615.

Prikhod'ko, L. V., and Kh. S. Bagdasarov. Temperature dependence of infrared absorption of fused quartz at high temperatures. OiS, no. 6, 1973, 1210-1211.

Sheyndlin, A. Ye., I. S. Belevich, and I. G. Kozhevnikov. Investigating enthalpy and heat capacity of zirconium carbide base materials. TVT, no. 3, 1973, 666-668.

Sokolova, T. V., A. P. Obukhov, A. A. Men', and T. B. Buzovkina. Investigating effective thermal conductivity of plasma sputtered aluminum oxide coatings during radiative heating in the 100-900° C temperature interval. I-FZh, v. 25, no. 1, 1973, 66-72.

Sumin, V. V., and Sh. I. Peyzulayev. Determining vapor pressure of pure zirconium by the method of fusion fluidized bed. ZhFKh, no. 6, 1973, 1604.

Volkov, G. A., and V. B. Dubrovskiy. Thermal conductivity of protective concrete. IN: Sb. Tr. Mosk. inzh.-stroit. in-t, no. 99, 1972, 3-12. (RZhKh, 12/73, no. 12M300).

Vompe, G. A. Thermal decomposition of methane at low pressures and high temperatures. ZhFKh, no. 6, 1973, 1396-1399.

Yavorskiy, I. A. Effect of carbon and carbon materials structure on their oxidation kinetics. Khimiya tverd. topliva, no. 1, 1973, 108-114. (RZhKh, 11/73, no. 11B1089).

iv. Miscellaneous Material Properties

Balovneva, I. I., and Ya. I. Shvidko. Investigating thermosetting resin base polymer-concretes for repairing concrete in airfield pavements. IN: Tr. Gos. proyekt.-izyskat. i NII <<AEROPROYEKT>>, no. 11, 1973, 110-114. (RZhKh, 11/73, no. 11M278)

Belov, K. P., S. A. Nikitin, A. M. Bisliyev, Ye. M. Savitskiy, V. F. Terekhova, and V. Ye. Kolesnichenko. Magnetic properties of RFe_3 type rare-earth metal-iron compounds. ZhETF, v. 64, no. 6, 1973, 2154-2159.

Borisova, Ye. A., and I. I. Shashenkova. Effect of prolonged heating at 500-700° C on mechanical properties and the surface layer state of titanium alloy sheets. IN: Sbornik. Struktura i svoystva titan. splavov. 1972, 149-154. (RZh Metallurgiya, 6/73, no. 6I734)

Bragin, D. Ya., A. M. Il'chenko, and I. N. Shkanov. Effect of titanium alloys structure on their fatigue strength at elevated temperatures. IN: Sbornik. Struktura i svoystva titan. splavov. 1972, 49-56. (RZhMetallurgiya, 6/73, no. 6I410)

Buturlakina, N. F., and A. I. Pavlov. Low-temperature mechanical properties of polymer films after processing by explosion. IN: Tr. Volgogr. politekhn. in-ta., no. 4, 1972, 119-128. (RZhMekh, 5/73, no. 5V1336).

Dobrodumov, A. V., and A. M. Yel'yashevich. Simulating brittle fracture of polymers on a net model by the Monte Carlo method. FTT, no. 6, 1973, 1891-1893.

Fialkov, A. S., and V. D. Chekanova. A polymeric graphite-carbon material: glassy carbon. Plasticheskiye massy, no. 6, 1973, 65-66.

Gol'denfel'd, I. V., R. N. Bondarenko, and V. G. Golovatyy. Metallic whisker emitters with a developed surface. PTE, no. 3, 1973, 166-168.

Kiselev, B. A., and A. V. Nikiforov. Organosilicon adhesive and glass-reinforced plastic. Plasticheskiye massy, no. 6, 1973, 29-31.

Kompaneyets, A. S. Substance in a superdense state. Zemlya i vselennaya, no. 3, 1973, 12-17.

Korshak, V. V., N. I. Bekasova, and M. P. Prigozhina. 1,7-(m-carboranylene) diamine base polyamides. Vysokomolekulyarnyye soyedineniya, Kratkiye soobshcheniya, no. 6, 1973, 422-425.

Korshak, V. V., G. Sh. Papava, B. M. Mgeladze, I. A. Gribova, A. N. Chumayevskaya, and N. A. Maysuradze. Investigating polycyclic polyarylate base composite materials. AN GruzSSR, soobshcheniya, v. 70, no. 3, 1973, 629-632.

Krzeminski, Jerzy. Recent views on fracture mechanisms. Rozpr. inz., v. 20, no. 3, 1972, 301-318. (RZhMekh, 5/73, no. 5V535)

Loginov, N. Z., and I. N. Shkanov. Dispersion of fatigue strength characteristics and structural inhomogeneity of two-phase titanium alloys. IN: Sbornik. Struktura i svoystva titan. splavov. 1972, 42-49. (RZhMetallurgiya, 6/73, no. 6I418)

Magrupov, M. A., B. D. Yusupov, K. Sh. Saidkhodzhayeva, and M. M. Akhmedov. Investigating effect of fillers on polyethylene conversion by thermal oxidation. AN UzbSSR, Uzbekskiy khimicheskiy zhurnal, no. 2, 1973, 41-43.

Meszaros, L., and M. Szabo. Continuous production of ultrapure metallic powders of millimicron particle size and their chemical applications. Acta phys. et chem. Szeged, v. 18, no. 3-4, 1972, 259-261. (RZhKh, 12/73, no. 12L199)

Osipov, K. A., G. E. Folmanis, Yu. N. Lozinskiy, and A. M. Sladkov. Properties of carbon films produced by a high-frequency discharge and from ion beams. NM, v. 9, no. 6, 1973, 1067-1068.

Osipyan, Yu. A., V. F. Petrenko, and G. K. Strukova. Investigating photoplastic effect on α- and β-dislocations in CdS. FTT, v. 15, no. 6, 1973, 1752-1756.

Popolitov, V. I., and A. N. Lobachev. Chemical synthesis and properties of cuprous iodide single crystals. NM, v. 9, no. 6, 1973, 1062-1063.

Reznikov, V. G., G. I. Rozenman, V. P. Melekhin, and R. I. Mints. Electron emission during transition to a superplastic state. ZhETF P, v. 17, no. 11, 1973, 608-609.

Smirnov, G. H., V. P. Kurochkina, and Z. P. Adno. Magnesium alloy. Author's certificate, USSR, no. 352729, published October 9, 1972. (RZhMetallurgiya, 6/73, no. 6I743).

Tesner, P. A., A. Ye. Gorodetskiy, A. P. Zakharov, and M. M Polyakova. Pyrocarbon formation on quartz from methane. DAN SSSR, v. 210, no. 6, 1973, 1379-1381.

Tkachenko, V. K. Transverse wave damping in rotating helium. ZhETF P, v. 17, no. 11, 1972, 617-618.

Uglov, A. A. Seminar on "Physics and chemistry of materials treatment by concentrated energy beams." FiKhOM, no. 3, 1973, 158-159.

Valetskiy, P. M., L. A. Glivka, L. V. Dubrovina, et al. 1, 7-bis (p-carboxyphenyl) carborane polyamides. Vysokomolekulyarnyye soyedineniya, no. 6, 1973, 1227-1233.

Vinogradova, S. V., V. V. Korshak, K. A. Andrianov, G. Sh. Papava, and I. S. Khitarishvili. Polycyclic bisphenol and poly (organosiloxane) oligomer base mixed block polyarylates. Vysokomolekulyarnyye soyedineniya, no. 6, 1973, 1215-1220.

Volkova, R. V., I. I. Skorokhodov, F. N. Vishnevskiy, B. V. Molchanov, S. A. Golubtsov, and N. A. Ivanova. Thermo-oxidative degradation of cross-linked polyorganosilonanes with tetra-functional links. Plasticheskiye massy, no. 6, 1973, 33-35.

Zhubanov, B. A., and Z. G. Akkulova. Polyamides synthesis by copolymerization of bismaleimides with aromatic hydrocarbons. Vysokomolekulyarnyye soyedineniya, Kratkiye soobshcheniya, no. 6, 1973, 473-475.

v. Superconductivity

Bashilov, V. A., D. G. Zhimerin, and Ya. N. Kunakov. Superconducting magnetic systems of Nb_3Sn ribbons. DAN SSSR, v. 210, no. 3, 1973, 570-572.

Bogatina, N. I., I. K. Yanson, and A. G. Batrak. Experimental study of optical phonons in lead oxide by tunnel spectroscopy. FTT, v. 15, no. 6, 1973, 1697-1703.

Bulayevskiy, L. N. Magnetic properties of layered superconductors with weak interaction between layers. ZhETF, v. 64, no. 6, 1973, 2241-2247.

Dmitrenko, I. M., Yu. G. Bevza, and V. I. Karamushko. Coupling energy dependence of spectral properties in weak superconducting contacts. PSS(a), v. 17, no. 1, 1973, 59-64.

Fal'ko, I. I., and V. L. Fal'ko. Energy spectrum of transition metals in a superconducting state. IVUZ Fiz, no. 6, 1973, 20-24.

Gabovich, A. M., and E. A. Pashitskiy. Magnetic susceptibility of degenerated electron gas. Interaction of nuclear magnetic moments in normal metals and superconductors. UFZh, v. 18, no. 6, 1973, 898-905.

Gal'perin, Yu. M., V. L. Gurevich, and V. I. Kozub. Electro-acoustic and thermoelectric effects in superconductors. ZhETF P, v. 17, no. 12, 1973, 687-690.

Glasov, B. V., V. G. Kotenko, V. I. Kurnosov, et al. Superconducting magnetic system made up of two solenoids with a vacuum active space. PTE, no. 3, 1973, p. 273.

Golovashkin, A. I., I. S. Levchenko, and G. P. Motulevich. Properties of superconducting niobium films, vacuum vaporized. KSpF, no. 12, 1972, 13-16.

Indenbom, V. L., and Yu. Z. Estrin. Possible mechanisms of plasticity changes during transition to the superconductive state. ZhETF P, v. 17, no. 12, 1973, 675-678.

Kirshenina, I. I., V. V. Luzanov, N. F. Novikov, et al. Investigating superconducting composite materials. IN: Sbornik. Pretsizionnyye splavy, no. 1. Moskva, izd-vo Metallurgiya, 1972, 91-98. (RZh Metallurgiya, 6/73, no. 6I744).

Kolodeyev, I. D. Sverkhprovodyashchiye elementy elektroavtomatiki. (Superconducting elements in electro-automation). Moskva, 1972, 96 p. (KL, 25/73, no. 19313).

Lukin, V. P., and A. V. Tulub. Destruction of the superconducting state in quasi-one-dimensional systems. VLU, no. 10, 1973, 7-18.

Morozov, V. I. Effectiveness of electron collection and recording in a beta-spectrometer with Si(Li)-detector and superconducting solenoid. PTE, no. 3, 1973, 42-44.

Petrusevich, I. V., F. N. Kozlov, V. P. Bogdanov, and L. A. Nisel'son Obtaining Nb_3Sn coatings from a gaseous phase NM, v. 9, no. 6, 1973, 952-955.

Sikora, A., V. Makiej, E. Trojnar and W. Jaszczuk. Characteristic of the electric field in a type II superconductor in resistive state. APP, v. A43, no. 6, 1973, 781-785.

Sirota, N. N., and A. K. Fedotov. Superconducting properties of a vanadium-niobium-chromium alloy system. DAN BSSR, v. 17, no. 6, 1973, 497-500.

Vatulin, I. F. S. N. Lukin, L. G. Oranskiy, V. V. Permyakov, V. V. Podlesnyy, and Yu. I. Yurkovskiy. Control circuit of a superconductor solenoid field. PTE, no. 3, 1973, 156-157.

Vitovskiy, N. A., G. A. Vikhliy, T. V. Mashovets, and S. M. Ryvkin. Method of producing superconducting material. Author's certificate, USSR, no. 348148, published July 23, 1971. (Otkr izobr, 19/73, p. 185)

Zavaritskiy, N. V., and M. S. Legkostupov. Magnetic measurements with a superconducting quantum fluxmeter. PTE, no. 3, 1973, 213-215

Zlunitsyn, E. S., A. I. Zykov, and V. A. Kushnir. A method of investigating parameters of superconducting resonators. PTE, no. 3, 1973, 243-245.

Zykov, A. I., B. R. Knyazev, and A. I. Tereshchenko. Investigating Q-factor of superconducting cavity resonators at fundamental and near-fundamental type oscillations. IN: Sbornik. Radiotekh., no. 24, 1973, 158-162.

vi. Epitaxial Films

Aksenova, L. L., G. I. Distler, A. V. Kovda, and Ye. I. Kortukova. Oriented crystallization of CdS. FTT, no. 5, 1973, 1633-1634.

Barybin, A. A., A. A. Zakharov, I. V. Kostyreva, and N. K. Nedev. Chemical decoration of n-type gallium arsenide regions with different electron concentrations. IVUZ Fiz, no. 6, 1973, 159-160.

Barybin, A. A., A. A. Zakharov, and N. K. Nedev. Effect of growth temperature on the physical properties of oxygen-doped epitaxial GaAs films. NM, v. 9, no. 6, 1973, 884-886.

Berkova, A. V., Yu. M. Gran, and L. D. Sabanova. Some structural characteristics of gallium arsenide epitaxial layers, grown from a liquid phase. IN: Nauch. tr. N.-i. proyekt. int. redkomet. prom-sti, v. 46, 1973, 49-53. (RZhKh, 11/73, no. 11B482)

Bolkhovityanov, Yu. B., R. I. Bolkhovityanova, and P. L. Mel'nikov. Obtaining thin GaAs films from solution, in the gap between substrates. NM, v. 9, no. 6, 1973, 887-890.

Csokan, Pal. Effect of micrographic structure on aluminum anodizing; effect of epitaxy, observed in oxide films. Magy. alum., v. 9, no. 11, 1972, 321-328. (RZhKh, 12/73, no. 12B1351).

Fedorenko, V. N., Yu. A. Raynov, B. T. Gribov, A. T. Akhin'ko, B. I. Kozyrkin, and Ye. B. Sokolov. Obtaining gallium arsenide epitaxial layers from a gaseous phase. IN: Sb. nauch. tr. po probl mikroelektron. Mosk. in-t. elektron. tekhn, no. 13, 1972, 141-143. (RZhKh, 11/73, no. 11B877)

Fedorenko, V. N., Yu. A. Raynov, Ye. B. Sokolov, B. T. Gribov, A. T. Akhin'ko, and B. I. Kozyrkin. Using organometallic compounds for producing gallium arsenide epitaxial layers. IN: ibid., 152-154. (RZhKh, 11/73, no. 11L87)

Gavrilov, G. M. Morfologiya poverkhnosti germaniyevykh plenok v zavisimosti ot usloviy ikh polucheniya vodorodno-khloridnym metodom. (Morphology of germanium film surfaces depending on conditions of their preparation by hydrogen chloride method). In-t novykh khim. probl. AN SSSR. Chernogolovka, Mosk. obl., 1972, 13 p. (RZhKh, 11/73, no. 11L111 Dep).

Kalnach, Ya. V., I. P. Neymane, and I. A. Feltyn'sh. Mechanism of β-silicon carbide film growth on silicon. IAN Lat, seriya fizicheskikh i tekhnicheskikh nauk, no. 3, 1973, 35-39.

Kulish, U. M. Growth rate and parameters of GaAs, and $In_xGa_{1-x}As$ film as functions of substrate orientation in the (111)-(100) interval (liquid epitaxy). IVUZ Fiz, no. 6, 1973, 121-123.

Kuznetsov, Yu. N., T. I. Markova, T. I. Ol'khovikova, and F. R. Khashimov. Effect of the substrate perfection on the structure of gallium arsenide epitaxial layers. FTT, no. 5, 1973, 1597-1599.

Lavrent'yeva, L. G., I. V. Ivonin, L. M. Krasil'nikova, Yu. M. Rumyantsev, and M. P. Yakubenya. Effect of crystallization temperatures on growth and alloying of autoepitaxial gallium arsenide layers. Pt. 1. Morphology of (1. 1. 1.075) A oriented layers. IVUZ Fiz, no. 6, 1973, 68-71.

Lavrent'yeva, L. G., Yu. G. Katayev, Yu. M. Rumyantsev, and A. D. Shumkov. Effect of crystallization temperatures on the growth and alloying of autoepitaxial gallium arsenide layers. Pt. 2. Electrophysical properties or (1. 1. 1.075) A oriented layers. IN: ibid., 71-75.

Metonidze, Z. A., L. S. Ivanov, V. N. Maslov, and Ye. B. Sokolov. Interaction of gallium with gaseous hydrogen chioride. IN: Sb. nauch. tr. po probl. mikroelektron. Mosk. in-t elektron. tekhn, no. 13, 1972, 104-111. (RZhKh, 12/73, no. 12L87).

Metonidze, Z. A., and Ye. B. Sokolov. Kinetics of gallium arsenide epitaxy in a hydride process. IN: ibid., 144-151. (RZhKh, 11/73, no. 11B481)

Pchelyakov, O. P., R. N. Lovyagin, E. A. Krivorotov, A. I. Toropov, L. N. Aleksandrov, and S. I. Stenin. Silicon homoepitaxy by ion sputtering. Pt. 1. Mechanism of growth. PSS(a), v. 17, no. 1, 1973, 339-351.

Sergeyeva, L. A., I. A. Charlamov, T. P. Kazannikova, and V. B Aleskovsky. Formation of epitaxial cadmium oxide and zinc oxide films by interaction of single-crystalline $A^{II}B^{VI}$ layers with oxygen. Krist. und Techn., v. 7, no. 8, 1972, 923-934. (RZhKh, 13/73, no. 13B600)

Vanyukov, A. V., and I. I. Krotov. Physico-chemical estimation of growth parameters of semiconducting $A^{II}B^{VI}$ compound films by the method of crystallization from vapor-gaseous phase in flow systems. IN: Sbornik. Khal'kogenidy tsinka, Kadmiya i rtuti. Mosk. in-t stali i splavov 73. Moskva, 1973, 124-138. (RZhKh, 11/73, no. 11B883)

Vigdorovich, V. N., and D. V. Yakashvili. Investigations in crystalline bismuth films preparation. IN: Sb. nauch. tr. po probl. mikroelektron. Mosk. in-t. elektron. tekhn., no. 13, 1972, 112-123. (RZhKh, 12/73, no. 12B879)

vii. Magnetic Bubble Materials

Petrova, L. O., E. I. Ilyashenko, and M. A. Rozenblat. Analysis of interaction between a magnetic saturated overlay and a magnetic bubble. PSS(a), v. 17, 1973, K19-K23.

6. Miscellaneous Interest

A. Abstracts

Gavrilov, F. V., A. S. Myasnikov, G. G. Zhadan, G. S. Orlova, and M. V. Strokin. Results of flight tests of an ion engine model with cesium-on-tungsten surface ionization. Kosmicheskiye issledovaniya, no. 1, 1973, 140-144.

The November 1969 and August 1970 flight tests of a cesium ion engine model are described and the flight test data of the model are given. The main purpose of the tests was to investigate the efficiency of different neutralizers of the accelerated ion beam under conditions in space. The principal components of the ion engine were the cesium ion source with porous tungsten, ion optical system, and the cesium vapor supply system. The ion engine and the neutralizers were tested on board the "Ion" unmanned space lab (FSL) (Fig. 1).

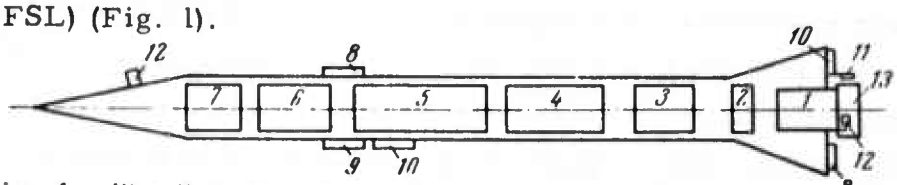

Fig. 1. "Ion" flying space lab: 1- ion engine, 2- magnetic amplifiers, 3- switch gear, 4- voltage converter, 5- power sources, 6- telemetry station, 7- programmer, 8- ion trap, 9- electrostatic fluxmeter, 10- multi-electrode probe, 11- thermionic neutralizers, 12- plasma neutralizer, 13- lid with sorption pump.

The FSL was launched from a geophysical rocket into a ballistic orbit to a maximum altitude of 300 km. The maximum speed attained was 2 km/sec and its rotation angular velocity was ~3 rps. The lid with the pump was jettisoned after 98 sec. (~140 km) from the engine start, simultaneously

with the opening of the supply system valve, and switching on of the plasma neutralizer heater. The maximum ion beam velocity was ~60 km/sec. As expected, the plasma neutralizer was the most efficient (Fig. 2). The most

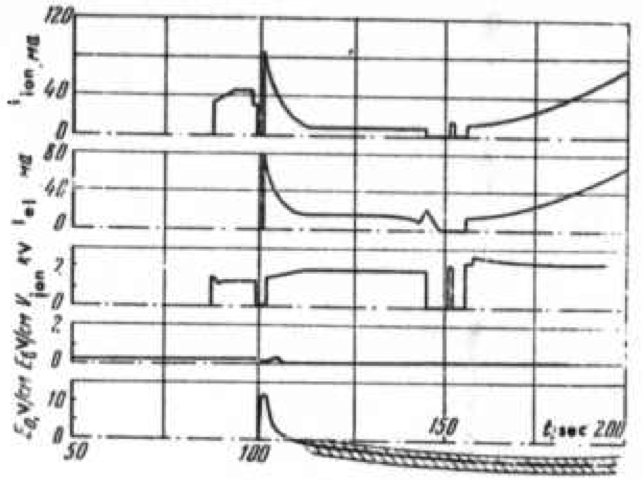

Fig. 2. Variations of ion current I_{ion}, electron current I_{el} ion source potential V_{ion}, FSL electric field intensity E_b, and the total FSL field intensity E_o during ion engine tests.

characteristic feature of the oscilloscope traces in Fig. 2 is the E_o variations after 98 sec. from the start. Heating of the plasma neutralizer results in formation of a plasma bridge from Cs ions and electrons emitted by a tungsten coil. The "cold" electrons penetrate the ion beam by crossing the bridge and thus cause a sharp drop in the beam space charge. The effect of shifting the thermionic neutralizer position in relation to the ion beam could not be ascertained.

Bondarenko, I. M., A. A. Zagorodnikov,
V. S. Loshchilov, and K. B. Chelyshev.
Relationship of sea state parameters to spatial spectrum of aerial photographs and radar images of the sea surface. Okeanologiya, no. 6, 1972, 1099-1106.

Algorithms are derived which relate sea state parameters to two-dimensional energy spectra of aerial photographs and radar images of the sea surface. The algorithms, together with formulas for correction of image scale distortions, can be used to determine various parameters of sea states from the sea surface optical and radar images, obtained with minimum distortion. Analysis of two-dimensional spectra of sea surface images shows the feasibility of determining the number, principal directions, frequency of maximum energy wave, dynamics of initiation and decay of wave systems, in addition to the direction and wave frequency of detached low-frequency wave components (swell). Simple formulas are also derived for computing complex one-dimensional (frequency) and two-dimensional sea state spectra. Special importance is attached to computation of the integral and narrow-band frequency angular spectra of the sea state from radar or photo-images of a large (15x15 km) sea area.

Azimi, Sh. A., A. V. Kalinin, and V. V. Kalinin.
Effect of electrical circuit parasitic inductance on parameters of pressure pulses generated from an electric discharge in water. VMU, Geologiya, no. 6, 1972, 97-101.

An investigation is made of the effect of the parasitic inductance generated in a coaxial cable, up to 300 m long, which carries the electrical

energy between the source and the ship or between the receiver and the source, in the formation of an electric discharge for purposes of seismoacoustic surveying. The theoretical basis for the experimental procedure is explained, and experimental facilities are described. The electric-spark discharge source was situated at a depth of 40 m, and the receiver was situated at a depth of 26.7 m directly underneath the source; in this manner, imposition of the pulse reflected from the water surface upon the direct-wave pulse was avoided. The discharge voltage was 10 kv from a 150 μf capacitor bank.

It was established that with a change of the inductance from 15 to 100 microhenries, which corresponds to increasing the length of the coaxial cable from 50 to 320 m, the intensity of the pressure pulse decreases by not more than 20%. Thus, for practical values of the length of the connecting coaxial cable (up to 300 m), the effect of the coaxial cable upon the pressure pulses may be disregarded. Pulse waveforms are shown for cables of different inductances.

B. Recent Selections

Belan, N. V., N. A. Mashtylev, B. I. Panachevnyy, and L. V. Shushlyapin. Effect of element distributions in a capacitive energy store on the form of current in pulsed plasma injector. ZhTF, no. 6, 1973, 1179-1183.

Bulekov, V. P., L. E. Graf, D. D. Dryuchenko, et al. Conducting an experiment on a test soil sample from the lunar surface with the Luna-20 station. Kosmicheskiye issledovaniya, no. 3, 1973, 460-464.

Bunkin, F. V., and V. M. Komissarov. Optical excitation of acoustic waves. Akusticheskiy zhurnal, v. 19, no. 3, 1973, 305-320.

Grishin, S. F., V. Ya. Chernyshenko, and I. R. Kirichek. A complex with VAK-2 heated diffusion pumps for pulling vacuums below 10^{-10} torr. IN: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza. Resp. mezhved. sb., no. 4, 1973, 228-232.

Ioffe, I. V., and Sh. A. Kuliyev. Photomagnetic and spin waves, and structures in ferromagnetic crystals. FTT, no. 6, 1973, 1863-1867.

Kotsarenko, N. Ya., S. V. Koshevaya, and I. V. Ostrovskiy. Waveguide converter of electromagnetic to acoustic waves. RiE, no. 6, 1973, 1205-1214.

Kuliyev, D. A. Wave impedance of a lightning channel. ZhTF, no. 6, 1973, 1233-1237.

Kuz'min, R. O. Lunokhod-2 explores the moon. Zemlya i vselennaya, no. 3, 1973, 34-39.

Landau, L. D., Ye. M. Lifshits, I. Ye. Dzyaloshinskiy, and D. N. Astrov. Magneto-electric effect in antiferromagnetic substances. Author's certificate, USSR, no. 123, published March 4, 1970. (Otkr izobr, 19/73, p. 18).

Leonov, G. S., and S. P. Khrameyeva. Investigating instabilities of an ultrahigh pressure short-arc discharge during current modulation. TVT, no. 3, 1973, 487-492.

Leykin, A. Ya., S. S. Moiseyev, I. S. Oleynik, V. S. Solov'yev, V. V. Slezov, and V. L. Sagalov. Theory of plasma frequency multipliers. IN: Tr. metrol. in-tov SSSR. Khar'kov. NII metrol., no. 7, 1972, 44-67. (RZh Elektr, 5/73, no. 5A282).

Luk'yanov, S. Yu. Goryachaya plazma i upravlyayemyy sintez (Hot plasma and controlled fusion). Izd-vo Nauka. (NK, 28/73, to be published late 1974).

Meshchankin, V. M. Correlation processing of shf holograms. RiE, no. 6, 1973, 1159-1164.

Mitin, R. V., A. V. Zvyagintsev, and K. K. Pryadkin. Electrodeless high pressure UHF discharge. TVT, no. 3, 1973, 493-497.

Morokhov, I. At the heart of matter: Soviet-American cooperation in peaceful uses of atomic energy. Sotsialisticheskaya industriya, 15 July 1973, p. 3.

Podzemnyy radar. Underground [acoustic] radar. Krasnaya zvezda, June 15, 1973, p. 3.

Povrozin, A. I. Opticheskiye izmereniya i opticheskiye izmeritel'nyye pribory. (Optical measurements and optical measuring instruments), 1972, 127 p. (KL Dop vyp, 5/73, no. 10261)

Shakhgil'dyan, V. V., and B. P. Burdzeyko. Statistical dynamics of a radio range finder with variable repetition rate. RiE, no. 6, 1973, 1172-1179.

Sharakhovskiy, L. I., V. S. Kulikov, A. G. Shashkov, and F. B. Yurevich. Voltage drop in an arc discharge between coaxial electrodes, in magnetic fields up to $3x10^6$ a/m. IAN B, Seriya fiziko-energeticheskikh nauk, no. 2, 1973, 76-83.

Sidorov, Yu. Ye. An optimum algorithm for radar detection of objects. RiE, no. 6, 1973, 1280-1282.

Sviryakin, D. I., A. I. Manets, and A. N. Kolupayev. Experimental study of an x-ray vidicon. IN: Izvestiya, Tomskogo politekhnicheskogo instituta, no. 213, 1972, 111-114. (RZh Elektr, 5/73, no. 5A219).

Zhdanov, A. I., L. Kh. Kitayevskiy, N. S. Repalov, et al. Using cybernetic methods in the study of plasma physics and controlled thermonuclear fusion. IN: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza. Resp. mezhved. sb., no. 4, 1973, 215-224.

7. SOURCE ABBREVIATIONS

AiT	-	Avtomatika i telemekhanika
APP	-	Acta physica polonica
DAN ArmSSR	-	Akademiya nauk Armyanskoy SSR. Doklady
DAN AzSSR	-	Akademiya nauk Azerbaydzhanskoy SSR. Doklady
DAN BSSR	-	Akademiya nauk Belorusskoy SSR. Doklady
DAN SSSR	-	Akademiya nauk SSSR. Doklady
DAN TadSSR	-	Akademiya nauk Tadzhikskoy SSR. Doklady
DAN UkrSSR	-	Akademiya nauk Ukrainskoy SSR. Dopovidi
DAN UzbSSR	-	Akademiya nauk Uzbekskoy SSR. Doklady
DBAN	-	Bulgarska akademiya na naukite. Doklady
EOM	-	Elektronnaya obrabotka materialov
FAiO	-	Akademiya nauk SSSR. Izvestiya. Fizika atmosfery i okeana
FGiV	-	Fizika goreniya i vzryva
FiKhOM	-	Fizika i khimiya obrabotka materialov
F-KhMM	-	Fiziko-khimicheskaya mekhanika materialov
FMiM	-	Fizika metallov i metallovedeniye
FTP	-	Fizika i tekhnika poluprovodnikov
FTT	-	Fizika tverdogo tela
FZh	-	Fiziologicheskiy zhurnal
GiA	-	Geomagnetizm i aeronomiya
GiK	-	Geodeziya i kartografiya
IAN Arm	-	Akademiya nauk Armyanskoy SSR. Izvestiya. Fizika
IAN Az	-	Akademiya nauk Azerbaydzhanskoy SSR. Izvestiya. Seriya fiziko-tekhnicheskikh i matematicheskikh nauk

IAN B	-	Akademiya nauk Belorusskoy SSR. Izvestiya. Seriya fiziko-matematicheskikh nauk
IAN Biol	-	Akademiya nauk SSSR. Izvestiya. Seriya biologicheskaya
IAN Energ	-	Akademiya nauk SSSR. Izvestiya. Energetika i transport
IAN Est	-	Akademiya nauk Estonskoy SSR. Izvestiya. Fizika matematika
IAN Fiz	-	Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya
IAN Fizika zemli	-	Akademiya nauk SSSR. Izvestiya. Fizika zemli
IAN Kh	-	Akademiya nauk SSSR. Izvestiya. Seriya khimicheskaya
IAN Lat	-	Akademiya nauk Latviyskoy SSR. Izvestiya
IAN Met	-	Akademiya nauk SSSR. Izvestiya. Metally
IAN Mold	-	Akademiya nauk Moldavskoy SSR. Izvestiya. Seriya fiziko-tekhnicheskikh i matematicheskikh nauk
IAN SO SSSR	-	Akademiya nauk SSSR. Sibirskoye otdeleniye. Izvestiya
IAN Tadzh	-	Akademiya nauk Tadzhiksoy SSR. Izvestiya. Otdeleniye fiziko-matematicheskikh i geologo-khimicheskikh nauk
IAN TK	-	Akademiya nauk SSSR. Izvestiya. Tekhni-cheskaya kibernetika
IAN Turk	-	Akademiya nauk Turkmenskoy SSR. Izvestiya. Seriya fiziko-tekhnicheskikh, khimicheskikh, i geologicheskikh nauk
IAN Uzb	-	Akademiya nauk Uzbekskoy SSR. Izvestiya. Seriya fiziko-matematicheskikh nauk
IBAN	-	Bulgarska akademiya na naukite. Fizicheski institut. Izvestiya na fizicheskaya institut s ANEB
I-FZh	-	Inzhenerno-fizicheskiy zhurnal

IiR	-	Izobretatel' i ratsionalizator
ILEI	-	Leningradskiy elektrotekhnicheskiy institut. Izvestiya
IT	-	Izmeritel'naya tekhnika
IVUZ Avia	-	Izvestiya vysshikh uchebnykh zavedeniy. Aviatsionnaya tekhnika
IVUZ Cher	-	Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya
IVUZ Energ	-	Izvestiya vysshikh uchebnykh zavedeniy. Energetika
IVUZ Fiz	-	Izvestiya vysshikh uchebnykh zavedeniy. Fizika
IVUZ Geod	-	Izvestiya vysshikh uchebnykh zavedeniy. Geodeziya i aerofotos"yemka
IVUZ Geol	-	Izvestiya vysshikh uchebnykh zavedeniy. Geologiya i razvedka
IVUZ Gorn	-	Izvestiya vysshikh uchebnykh zavedeniy. Gornyy zhurnal
IVUZ Mash	-	Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroyeniye
IVUZ Priboro	-	Izvestiya vysshikh uchebnykh zavedeniy. Priborostroyeniye
IVUZ Radioelektr	-	Izvestiya vysshikh uchebnykh zavedeniy. Radioelektronika
IVUZ Radiofiz	-	Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika
IVUZ Stroi	-	Izvestiya vysshikh uchebnykh zavedeniy. Stroitel'stvo i arkhitektura
KhVE	-	Khimiya vysokikh energiy
KiK	-	Kinetika i kataliz
KL	-	Knizhnaya letopis'
Kristall	-	Kristallografiya
KSpF	-	Kratkiye soobshcheniya po fizike

LZhS	-	Letopis' zhurnal'nykh statey
MiTOM	-	Metallovedeniye i termicheskaya obrabotka materialov
MP	-	Mekhanika polimerov
MTT	-	Akademiya nauk SSSR. Izvestiya. Mekhanika tverdogo tela
MZhiG	-	Akademiya nauk SSSR. Izvestiya. Mekhanika zhidkosti i gaza
NK	-	Novyye knigi
NM	-	Akademiya nauk SSSR. Izvestiya. Neorganicheskiye materialy
NTO SSSR	-	Nauchno-tekhnicheskiye obshchestva SSSR
OiS	-	Optika i spektroskopiya
OMP	-	Optiko-mekhanicheskaya promyshlennost'
Otkr izobr	-	Otkrytiya, izobreteniya, promyshlennyye obraztsy, tovarnyye znaki
PF	-	Postepy fizyki
Phys abs	-	Physics abstracts
PM	-	Prikladnaya mekhanika
PMM	-	Prikladnaya matematika i mekhanika
PSS	-	Physica status solidi
PSU	-	Pribory i sistemy upravleniya
PTE	-	Pribory i tekhnika eksperimenta
Radiotekh	-	Radiotekhnika
RiE	-	Radiotekhnika i elektronika
RZhAvtom	-	Referativnyy zhurnal. Avtomatika, telemekhanika i vychislitel'naya tekhnika
RZhElektr	-	Referativnyy zhurnal. Elektronika i yeye primeneniye

RZhF	-	Referativnyy zhurnal. Fizika
RZhFoto	-	Referativnyy zhurnal. Fotokinotekhnika
RZhGeod	-	Referativnyy zhurnal. Geodeziya i aeros''-yemka.
RZhGeofiz	-	Referativnyy zhurnal. Geofizika
RZhInf	-	Referativnyy zhurnal. Informatics
RZhKh	-	Referativnyy zhurnal. Khimiya
RZhMekh	-	Referativnyy zhurnal. Mekhanika
RZhMetrolog	-	Referativnyy zhurnal. Metrologiya i izmeritel'naya tekhnika
RZhRadiot	-	Referativnyy zhurnal. Radiotekhnika
SovSciRev	-	Soviet science review
TiEKh	-	Teoreticheskaya i eksperimental'naya khimiya
TKiT	-	Tekhnika kino i televideniya
TMF	-	Teoreticheskaya i matematicheskaya fizika
TVT	-	Teplofizika vysokikh temperatur
UFN	-	Uspekhi fizicheskikh nauk
UFZh	-	Ukrainskiy fizicheskiy zhurnal
UMS	-	Ustalost' metallov i splavov
UNF	-	Uspekhi nauchnoy fotografii
VAN	-	Akademiya nauk SSSR. Vestnik
VAN BSSR	-	Akademiya nauk Belorusskoy SSR. Vestnik
VAN KazSSR	-	Akademiya nauk Kazakhskoy SSR. Vestnik
VBU	-	Belorusskiy universitet. Vestnik
VNDKh SSSR	-	VNDKh SSSR. Informatsionnyy byulleten'
VLU	-	Leningradskiy universitet. Vestnik. Fizika, khimiya
VMU	-	Moskovskiy universitet. Vestnik. Seriya fizika, astronomiya

ZhETF	-	Zhurnal eksperimental'noy i teoreticheskoy fiziki
ZhETF P	-	Pis'ma v Zhurnal eksperimental'noy i teoreticheskoy fiziki
ZhFKh	-	Zhurnal fizicheskoy khimii
ZhNiPFiK	-	Zhurnal nauchnoy i prikladnoy fotografii i kinematografii
ZhNKh	-	Zhurnal neorganicheskoy khimii
ZhPK	-	Zhurnal prikladnoy khimii
ZhPMTF	-	Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki
ZhPS	-	Zhurnal prikladnoy spektroskopii
ZhTF	-	Zhurnal tekhnicheskoy fiziki
ZhVMMF	-	Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki
ZL	-	Zavodskaya laboratoriya

8. AUTHOR INDEX